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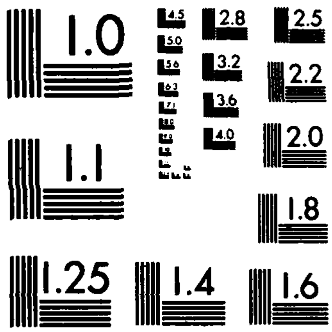
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A HEURISTIC FORTRAN MODEL OF THE IDENTIFICATION AND ALLOCATION OF CONUS PRIME BEEF FORCES IN SUPPORT OF THEATER OPLAN REQUIREMENTS

Neil K. Kanno, Captain, USAF
Duncan H. Showers, Captain, USAF

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DEPARTMENT OF THE AIR FORCE
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Wright-Patterson Air Force Base, Ohio

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The wartime mission of the Air Force Prime Base Engineer Emergency Forces (BEEF) is to deploy and augment theater civil engineering in accordance with the appropriate operation plan (OPlan). A current problem with the Prime BEEF deployment process involves the identification and allocation of continental United States (CONUS) Prime BEEF resources for each pre-designated theater base. Contingency command planners give little or no consideration towards maintaining force integrity when identifying which Prime BEEF team satisfies a theater requirement. This research examines the current Prime BEEF force-identification and allocation process. Also this research develops a heuristic FORTRAN model which simulates the tasking process while emphasizing force integrity. Two unclassified, test data bases were introduced to the model. The research results demonstrate how the concept emphasizing force integrity can be incorporated throughout the force-identification decision process. The resultant force-identification information provided by the model gives the contingency command planner an initial Prime BEEF force and deployment list.

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A HEURISTIC FORTRAN MODEL OF THE IDENTIFICATION AND ALLOCATION OF CONUS PRIME BEEF FORCES IN SUPPORT OF THEATER OPLAN REQUIREMENTS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Engineering Management

By

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This thesis, written by

Captain Neil K. Kanno

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CHAPTER I

INTRODUCTION

Overview

During wartime contingencies, Air Force (AF) Prime Base Engineer Emergency Forces (BEEF) are mobilized and deployed in accordance with appropriate force and transportation deployment operation plans (OPlan). Given the mission objectives, destination requirements, and transportation availability, the effectiveness of deployed Prime BEEF teams to provide wartime civil engineering (CE) support is highly dependent upon how efficiently the Prime BEEF resources are allocated.

This chapter develops the general framework where the Prime BEEF team tasking process is conceptualized and analyzed. First, a brief background description of how the Prime BEEF deployment process has evolved since the mid-1960s is presented. Next, literature dealing with team cohesiveness is reviewed and the research justification is presented. Third, the specific problem this research attempts to answer is stated, and the attendant research objectives and question are outlined. Finally, the scope and definitions of technical terms used in this study are presented.

Background

Since the early 1960s, the United States Air Force (USAF) has recognized the importance of the Prime BEEF program as an essential element of their overall contingency readiness posture. Prime BEEF has provided trained and equipped mobile civil engineering (CE) teams for rapid, worldwide combat support roles. From its beginning in 1964, the Prime BEEF program was designed for dual use of CE forces who performed real property operations and maintenance during peacetime and also prepared for possible contingency and wartime situations (Day & Murray, 1979; USAF IG--FMI, 1982).

The emergence of the conflict in Southeast Asia in the mid-1960s highlighted the shortfall that existed in CE contingency readiness. In 1963, a special joint Air Force Civil Engineering Manpower and Organization Study Group was formed to review the structure of the CE force and evaluate its adequacy regarding mission accomplishment. The Study Group concluded that some realignment of the engineer force was needed. Additionally, the Study Group decided that a minimum military force was required to participate in contingency operations. Consequently, the direct result of this Study Group was the formal establishment of the Prime BEEF program (Chronicle, 1970; What's Ahead, 1974; Day & Murphy, 1979).

Initially, about 200 sixty-man Prime BEEF teams were established in the active and reserve military force. By the mid-1970s, Prime BEEF units were incorporated into many major operations plans (OPlans). However, their contingency missions were still not clearly defined (USAF IG--FMI, 1982).

In 1978, a revision of the Department of Defense Directive (DODD) 1315.6, Responsibilities for Military Troop Construction Support of the Department of the Air Force Overseas, clearly outlined Air Force engineering troop responsibilities in overseas theaters. This directive defined the following missions as Air Force Civil Engineering responsibilities (USAF IG--FMI, 1982):

1. Emergency repair of war damage to air bases.
2. Force beddown of Air Force units and weapon systems.
3. Operations and maintenance of Air Force facilities and installations.
4. Crash rescue and fire suppression.
5. Construction management of emergency repair of war damage and force beddown.

Additionally, a Joint Chiefs of Staff (JCS) sponsored Tri-Service Joint Contingency Construction Requirements Study (JCCRS) regarding engineering requirements for a NATO conflict scenario indicated that in the event of a general war in Europe, all active and reserve Continental United States (CONUS) Air Force CE personnel were required to support combat operations. The JCCRS also concluded

that even after the deployment of all CE personnel, a shortfall would still exist (USAF IG--FMI, 1982).

In 1978, based upon the 1963 joint Study Group findings, DODD 1315.6, and the JCCRS, HQ USAF redefined the existing CE mobility posture and restructured the Prime BEEF force. Consequently, all active and reserve CONUS CE military personnel (approximately 28,500 personnel) assumed a worldwide mobility role. The CONUS Prime BEEF forces would deploy and augment the overseas Prime BEEF forces (approximately 8,400 personnel) already deployed in the potential theater of operations (USAF IG--FMI, 1982; Day & Murray, 1979; AFR 93-3, 1982).

This restructuring of the Prime BEEF force provided a CE capability flexible enough to meet AF contingency engineering requirements. The Prime BEEF structure uses the "building block" concept. This concept involves six types of contingency teams that build upon each other to create various combinations depending on mission requirements. The size of the composite Prime BEEF force is based upon an analysis of the expected wartime tasks and those skills needed to accomplish those tasks (AFR 93-3, 1982).

The Prime BEEF team structure and capabilities, as outlined in AFR 93-3, Air Force Civil Engineering Prime Base Emergency Engineering Force (BEEF) Program, are shown in Appendix A.

Currently, the expanding Soviet Union conventional war capability in Western Europe has emphasized the requirement for rapidly-deployable Prime BEEF teams. Prime BEEF's ability to support aircraft launch and recovery and high sortie generation rates, as well as provide emergency war damage repair, is an integral part of the wartime and contingency OPlans in this theater (Day & Murray, 1979; Denham, 1983; Eng, 1983). Prime BEEF's success in fulfilling the objectives outlined for them in the OPlans is dependent partly upon two factors:

1. What type and size of Prime BEEF force are needed to accomplish the designated mission?

2. How efficiently and quickly are the Prime BEEF forces mobilized and deployed to a theater of operations?

The type and size of Prime BEEF force that are needed to support an OPlan are determined by the supported unified commander. Given the threat, the prevailing defense guidance, and available resources, the supported command planners identify, task, and time-phase Prime BEEF teams to accomplish OPlan engineering objectives.

In the Western European theater, the Force Development Division at Headquarters United States Air Forces in Europe, Deputy Chief of Staff, Engineering and Services (HQ USAFE/DEXD), is responsible for establishing Prime BEEF force requirements. HQ USAFE/DEXD integrates the available CONUS-based Prime BEEF teams, as identified in

the War and Mobilization Plan Three (WMP-3), with European-based Prime BEEF teams to develop a comprehensive engineering support plan. HQ USAFE/DEXD coordinates the engineering support plan with the HQ USAFE/XP (Deputy Chief of Staff, Planning) to ensure that the AF engineering requirements in Europe satisfy their part of the overall USAFE OPlan (Evans, 1983; Bartlow, 1983).

The Prime BEEF force requirements are then put into the Joint Operation Planning System (JOPS), which provides deployment information to unified and supporting commands in order to build and support detailed joint OPlans. The JOPS process involves a complex process of force, deployment, and transportation planning, resolution of deficiencies, and plan documentation, which specifically results in the development of the Time-Phased Force and Development Data (TPFDD) document (AFR 93-3, 1982; Sutton, 1980; AFR 28-3, 1982).

Suporting commands, which include the CONUS major commands (MAJCOMs), have the responsibility of allocating or "sourcing" Prime BEEF teams within their command to fulfill the TPFDD requirements. Each supporting MAJCOM distributes the force requirements listing to their respective force development division. The force requirements list includes the type of Prime BEEF team required, the number of teams required, the final deployment locations, and the required delivery dates (RDD). The force development

divisions identify the command Prime BEEF teams that will fulfill the force requirements listing.

Until a few years ago, MAJCOM force development planners sourced their Prime BEEF teams by attempting to deploy their teams to the same destinations as other deploying units in their command. However, this method of selection often resulted in Prime BEEF teams being separated from other teams from the same CONUS base. This circumvents any advantages gained through home station training (Denham, 1983; Evans, 1983).

Presently, MAJCOM planners attempt to minimize this separation effect by informally contacting other MAJCOM planners and "trading" for theater destinations that will enhance the integral deployment of their own Prime BEEF teams (Denham, 1983; Evans, 1983).

The basis for these actions is rooted in the belief that Prime BEEF's mission effectiveness is enhanced if teams are deployed with other teams from the same CONUS base. Thus, each base and the assigned teams are considered as an integral team. A review of current literature dealing with team cohesiveness and group work effort strongly supports the idea of team cohesiveness as being more productive and efficient. The local exercises in which Prime BEEF teams train among themselves is one way to increase Prime BEEF's ability to accomplish the OPlan objectives (USAF IG--FMI, 1982; Denham, 1983; Eng, 1983).

Literature Review

The premise of whether Prime BEEF's mission performance is enhanced by deploying individual teams from the same CONUS base to a theater location is examined here. This literature review summarizes research relating to the consequences of maintaining group integrity or cohesion on an individual's and a group's performance.

Definition of a Group

Schein's (1970) definition of "group" is:

> A psychological group is any number of people who (1) interact with one another, (2) are psychologically aware of one another, and (3) perceive themselves to be a group.

From the perspective of task design and group processes, Griffin (1982) defines the "group" as "a set of two or more interdependent people who interact in order to achieve a common goal." Mutual awareness, mutual interaction, and a common goal are necessary ingredients for defining a more aggregate of people as a group.

Formation and Characteristics of Groups in Organizations

The organization provides the impetus toward the formulation of various, smaller functional task groups. The organization's ultimate task is divided into subtasks which are assigned to various subunits. These subunits may further subdivide the task and pass it down further until the subtask is divided among individuals. Schein

(1970) concluded that "what basically breaks an organization into groups, therefore, is division of labor."

Within an organization, there can exist formal or functional groups, informal groups, and task or project groups (Albanese, 1981; Griffin, 1982). Albanese (1981) defined formal groups as "part of the official organization design, and their function is to accomplish specific goals as defined by the organization." These formal groups have indefinite time horizons and include functional departments in an organization, such as the manufacturing department, accounting department, and engineering department.

Informal groups "evolve out of the official organization primarily in order to satisfy needs of organization members that are not being satisfied by formal group memberships [Albanese, 1981]." Examples include social groups, people who gather for lunch every day, and, in some cases, trade unions.

Task or project groups "are also created and specified by the organization, but generally have a specific task and a more limited time horizon [Albanese, 1981]." Examples of task groups include committees, project planning teams, and task forces such as USAF Prime BEEF teams.

Organizational and group theorists have identified and described a number of basic characteristics that can directly affect the performance of individuals in a group. The characteristics most commonly described include size,

composition, norms, cohesiveness, and status systems (Albanese, 1981; Griffin, 1982; Lott & Lott, 1971). Group cohesiveness and norms, according to Wallace and Szilagyi (1982), were the two group characteristics which most affected actual group task performance.

Definition of Group Cohesiveness

Festinger (1950) defined group cohesiveness "as the resultant of all forces which act to keep members within a group." Cartwright and Zander (1968) grouped these cohesive forces into two general categories: those that satisfy group members' needs for attraction to, or satisfaction with, other group members, and those that positively influence the achievement of personal goals of the group members.

Finally, Griffin (1982) defined group cohesiveness as members who are "attracted to each other and the extent to which members are motivated to maintain the integrity of the group."

Group Cohesiveness and Performance

Groups with greater interpersonal attraction among its members, more team spirit, and stronger feelings of unity can cause performance differences (Hampton et al., 1982). Davis (1969) observed that the desire to be together can increase the time that group resources are available to be applied to the task. Seashore (1954)

reported that cohesive groups provided support and acceptance to individual members, thereby reducing anxieties that may weaken their performance.

Two studies performed on military task groups found correlations between interpersonal attraction and performance on some particular task. Berkowitz (1956) found a significant relationship between aircrew members' attitudes toward one another and the aircrew's actual combat effectiveness. Goodacre (1951, 1953) reported positive correlations between various indices of group cohesiveness and the field scores made by combat and rifle squads.

Lott (1961) concluded from her studies that the greater the attraction between group members, the higher the general level of group activity, the quantity (not necessarily the quality) of task production, and the level of communication. In addition, she predicted that more efficient learning occurred in high than in low cohesive groups.

Lott and Lott (1971), in their critical review of the literature on measuring group cohesiveness in terms of interpersonal attraction, presented numerous studies that examined the relationship between cohesiveness and task performance. Lott and Lott cited studies in which individual and group performances were positively affected when group cohesiveness was tested under a variety of factors. These factors included:

1. Personal attraction. Cohesiveness was enhanced if members were attracted to one another.

2. Favorable evaluation. Cohesiveness was likely to increase if the group was favorably evaluated.

3. Compatibility and cooperativeness. Studies indicated that better task performance and more productivity was achieved with compatible and cooperative group members.

Lott and Lott also found several studies which contradicted the positive correlation between group cohesiveness and performance. In general, the following factors were tested on group cohesiveness and were found to adversely affect performance:

1. Intra-group competition. Competition among individual group members adversely affected group performance.

2. Domination. When one or more group members attempted to dominate the group, performance declined.

3. Unpleasant experiences with the group. When members were not attracted to each other, trust was low, or when adverse things happened to the group, cohesion and performance declined.

Wallace and Szilagyi (1982) proposed that an investigation of the relationship between cohesiveness and group performance was incomplete without looking at the influence of group norms on performance. Group norms are

expected levels of performance to be attained by the group and/or its members. Some groups may have high performance levels; they work hard at achieving a high level of productivity. Unlike group cohesiveness, group norms do have specific relevance for task design processes. For example, many groups have norms which have new group members performing some task or set of tasks that is unappealing, or gets in the way of effective task performance (Griffin, 1982).

Because group members value the membership in a cohesive group, an individual would be more responsive to the demands and norms of the cohesive group. Two conclusions can be drawn if this assumption is correct (Wallace & Szilagyi, 1982):

1. The major difference between high and low cohesive groups would be how closely members conform to group norms; and

2. Group performance would be influenced not only by cohesiveness, but also by the level or strength of group norms.

Research by Wallace and Szilagyi (1982) supports this assumption that group performance is a function of group cohesiveness and norms. Groups with higher levels of cohesiveness and performance norms achieved higher levels of group performance. Yet, high cohesiveness combined with low performance norms yielded low performance. Wallace and Szilagyi concluded that:

> One must not only work to increase the group's cohesion, but also insure that the group norms are at a level that contributes to the overall good of the organization.

Conclusions

Research on the antecedents of group cohesiveness indicate that it is one of the most powerful determinants of group performance. The group solidarity associated with a cohesive environment creates a unity of purpose that is a positive influence on performance.

The concept of group cohesiveness can be extended to AF Prime BEEF teams at a CONUS base. Griffin's (1982) definition of group cohesiveness is applicable to AF Prime BEEF teams. The interpersonal attraction and feelings of unity among team members are directly attributable to the Prime BEEF training program and their day-to-day work interaction. As several studies found, particularly those on military groups reported by Berkowitz (1956) and Goodacre (1951, 1953), task performance is enhanced if group cohesiveness exists.

CONUS contingency MAJCOM planners intuitively realize the benefits gained by identifying multiple teams from a base to satisfy a theater requirement. The MAJCOM planners are aware that in spite of the uniform training all Prime BEEF teams receive, individual CONUS teams would perform more effectively if deployed together rather than

tasked to join up with teams from a different CONUS base (Bartlow, 1983; Denham, 1983; Evans, 1983).

However, as Lott and Lott (1971) found, several factors adversely affect group cohesiveness and hence, task performance. These factors are sources of concern to both the contingency command planner and the base Prime BEEF manager. They must be cognizant of these factors which can undermine group cohesiveness and possibly affect the team's ability to perform its wartime tasks. Not only must managers be cognizant of these factors, they must work to eliminate these factors.

While the relationship between group cohesiveness and performance is substantiated by numerous studies, the findings of Wallace and Szilagyi (1982) demonstrate the influence of group norms. The important factor to understand is that group performance appears to be enhanced by a combination of high group cohesiveness and high performance norms, both characteristics of Prime BEEF teams.

Justification of the Study

From February 1981 to January 1982, the USAF Inspector General (IG) conducted a Functional Management Inspection of the Air Force (AF) civil engineering contingency readiness. The purpose of the inspection was:

> . . . to evaluate the effectiveness and efficiency of programs supporting Civil Engineering contingency readiness to meet worldwide combat support roles [USAF IG--FMI, 1982].

The USAF IG observed that each CONUS MAJCOM independently sourced their Prime BEEF teams to fulfill their theater OPlan taskings. As a result, integral base Prime BEEF teams were splintered to complete the programmed force structure required at a theater destination. During their investigation, the inspectors found that the force structure required at a destination did not necessitate splintering the integral Prime BEEF teams (USAF IG--FMI, 1982).

Based upon their observations, the USAF IG concluded that breaking up cohesive base Prime BEEF teams "negated teamwork derived from the Prime BEEF home station training [USAF IG--FMI, 1982]." In regards to the individual MAJCOM planners attempting to consolidate Prime BEEF team deployments, the USAF IG suggested that:

> Although such action may work well for some situations, it may not be appropriate when large TPFDLs [Time-Phased Force and Deployment Lists], required delivery dates, and Air Force-wide airlift are involved [USAF IG--FMI, 1982].

Overall, the inspectors concluded that:

> Prime BEEF tasking procedures supporting operation plan Time-Phased Force and Deployment List (TPFDL) development did not insure optimum use of team capabilities and transportation availability [USAF IG--FMI, 1982].

In an attachment to a letter sent to all MAJCOM Engineering and Services (E&S) directors (DEs), Major General Clifton D. Wright, Director of Engineering and Services, HQ USAF/LEE, outlined the AF E&S's 1983 strategic plans. Establishing policy guidance to the MAJCOM DEs

in the form of goals and objectives, Major General Wright wrote that the AF civil engineers needed to:

> Improve OPlan contingency team sourcing methodology to maximize force integrity at deployment locations, minimize transportation requirements, and maximize force utilization [Wright, 1982].

Statement of Problem

Presently, when CONUS Prime BEEF resources are identified as reinforcement forces by supported command planners, little or no consideration is given to maintaining the integrity of deploying Prime BEEF teams. Not considering team cohesiveness during selection of forces is a weakness in the force-identification decision process which negates any teamwork advantage gained through home station training programs. The present study investigated current Prime BEEF team tasking procedures and developed a model of this decision process which includes full consideration of the advantage of team integrity.

Research Objectives

The overall objective of this research was to develop a model describing the Prime BEEF team tasking procedure which supporting and supported command force development planners may employ to allocate Prime BEEF resources in support of an OPlan. Directed towards the accomplishment of this overall objective, the following specific research objectives were to:

1. Examine the current Prime BEEF tasking procedure process.

2. Develop a model that describes the Prime BEEF team tasking process and facilitates the accomplishment of Prime BEEF's contingency objectives while incorporating team integrity within the model.

Research Question

In order to accomplish the research objectives, the following research question was posed:

How can the Prime BEEF team tasking process be modeled so that team integrity is considered when Prime BEEF teams are designated to support OPlan mission objectives?

Scope of Study

This study does not evaluate or compare the Prime BEEF deployment tasking process with the deployment tasking process of other Air Force organizations or of other DOD services. However, this study does examine the current Prime BEEF deployment tasking procedures and determines those factors that affect force integrity at deployment locations. Finally, this study develops a model of the Prime BEEF tasking process which includes consideration of Prime BEEF team integrity during allocation from origin to deployment destination.

Definitions

The following terms are used throughout this research effort (Sutton, 1980):

1. Deployment. The relocation of augmentation forces from one command, normally CONUS based, to a crisis area where the forces assigned to the unified commander are inadequate.

2. Supporting Command. Major Commands which provide mobility forces.

3. Supported Command. The command which has the primary responsibility for the mission and is the originator of the operation plan which is being supported.

4. Joint Operation Planning System (JOPS). The Joint Chiefs of Staff (JCS) planning system that consolidates policies and procedures for the development, review, and approval of joint operation plans.

5. War and Mobilization Plan--3 (WMP-3). Reflects the Air Force position on wartime availability of combat flying and support forces by type of equipment for each planning contingency. WMP-3 contains a listing of UTCs for various AF units. This list includes mission capability statements and total transportation requirements for deployable units.

6. Time-Phased Force and Deployment Data (TPFDD). The complete file of force and transportation data required

by an operation plan. It is composed of the TPFDL and the TPTRL.

7. Time-Phased Force and Deployment List (TPFDL). A list of combat and support forces required by an operation plan.

8. Time-Phased Transportation Requirements List (TPTRL). Describes the movement requirements for an operation plan and depicts the movement priorities.

Summary

This chapter presented the general framework for this research. Background information on the Prime BEEF deployment and tasking process was presented. Current literature on group cohesiveness was reviewed and the justification for investigating this problem was stated. The research problem involving current Prime BEEF taskings and the development of a model to describe that process was discussed along with the associated research objectives and question. Finally, the scope of this study and definitions of any technical terms that were used throughout this report were presented.

The development of the general framework for this study leads to the conceptualization phase. During the conceptualization phase, the Prime BEEF team tasking process is broken into its main components and analyzed. A model

is then formulated which processes the available data to produce results useful for the analysis of the research objectives and questions.

CHAPTER II

METHODOLOGY AND DATA PREPARATION

Overview

The purpose of this research was to investigate current deployment tasking procedures of Air Force Civil Engineering Prime BEEF teams. Specifically, this effort developed a computer model of the force tasking decision process which maintains the integrity of Prime BEEF resources from their CONUS home base to final deployed locations. The Air Force deployment process, major command involvement, and the roles and missions of Prime BEEF teams were discussed in the previous chapter.

In order to better understand the deployment process as it applies here, it is necessary to conceptualize the elements and diverse interactions of Prime BEEF sourcing within the whole deployment system. Shannon (1975) states that a "model is a representation of an object, system, or idea in some form other than that of the entity itself." A model of the system used to source Prime BEEF teams that allows for manipulation of key variables in order to gain insight about the real system would be ideal; simulation models provide this capability. Therefore, this chapter describes basic simulation methods, including a

review of the data available for analysis. Additionally, the simulation language and techniques used for this research are described.

Basic Simulation Methods

Shannon (1975) describes the following stages for distinguishing the simulation process:

1. System Definition--determining the boundaries, restrictions and measures of effectiveness to be used in defining the system to be evaluated.
2. Model Formulation--reduction or abstraction of the real system to a logic flow diagram.
3. Data Preparation--identification of the data needed by the model, and their reduction to an appropriate form.
4. Model Translation--description of the model in a language acceptable to the computer to be used.
5. Validation--increasing to an acceptable level the confidence that an inference drawn from the model about the real system will be correct.
6. Strategic Planning--design of an experiment that will yield the desired information.
7. Tactical Planning--determination of how each of the test runs specified in the experimental design is to be executed.
8. Experimentation--execution of the simulation to generate the desired data and to perform sensitivity analysis.
9. Interpretation--drawing inferences from the data generated by the simulation.
10. Implementation--putting the model and/or results to use.
11. Documentation--recording the project activities and results as well as documenting the model and its use.

These stages assume that the problem can be best solved by simulation. Since it is necessary to fit the tool to the problem, we must first examine the system we are interested in.

System Definition

The deployment system, from supported command to supporting command, was described in Chapter I. A subset of this system are those deployment actions that directly affect the resources of civil engineering Prime BEEF teams. As indicated in Chapter I, requirements are generated by the supported command and sourced against supporting major air command (MAJCOM) resources. It is important to recognize that when the resources are matched with requirements and forces identified for deployment, they are then entered into an OPlan, and a TPFDL, described in Chapter I, is then generated.

The major factor affecting Prime BEEF team integrity involves the initial generation of civil engineering requirements (Evans, 1983; Bartlow, 1983; Kelly, 1983). Presently there is no systematic process used to identify USAFE Prime BEEF requirements against the CONUS Prime BEEF resources. Rather, the USAFE force development staff "selects," using the WMP-3, and identifies CONUS forces to fulfill their theater requirements (Bartlow, 1983). This is done with no planned consideration for deploying base level resources to the same deployed location. Although the USAFE force development planners attempt to select forces based upon the mission of the deploying operational force, it is readily apparent that the number of deploying

tactical units far outnumbers the number of tactical Prime BEEF teams available.

This failure to consider CONUS Prime BEEF team integrity/cohesiveness is a weakness in the current force-identification decision process. This weakness is key to developing a model of the Prime BEEF team deployment system. Therefore, a systematic, computerized method, with identified decision priorities, was used to model the selection of CONUS resources for overseas employment. Our model of this process sources CONUS Prime BEEF teams in a "team integrity conscious" mode. Consequently, the use of a logical decision process for sourcing Prime BEEF resources should enable Prime BEEF team integrity to be maintained at a much higher level than it is today. It is important to note that because force requirements invariably outnumber resources available, not all Prime BEEF teams from the same CONUS base will be able to deploy to the same location. However, the use of a decision process for Prime BEEF sourcing is a large improvement over the current "system" which does not incorporate team integrity except through personal efforts (Evans, 1983; Bartlow, 1983; USAF IG--FMI, 1982).

Model Formulation

The verbal and pictorial description of a system identifies the basis for model formulation. Model design

incorporates inputs and outputs as well as information about the various components of the system under investigation. While the model formulation process incorporates all active factors of the system, it must be emphasized that construction of any model is to assure that only the factors having direct bearing on the system are included. As Shannon (1975) states:

> The tendency is nearly always to simulate too much detail rather than too little. Thus, one should always design the model around the questions to be answered rather than imitate the real system exactly.

Designing an *exact model* often leads the analysts to transfer all detailed difficulties of the real world into the model. Unfortunately, this causes increased programming difficulty and additional costs of longer experimental runs, and sometimes the truly significant relationships get lost in all the detail (Shannon, 1975).

Examination of the decision process used to task CONUS resources reveals a system within a system. Illustrated in Figure 2-1 is the logic flow of the decision process which inputs theater requirements and CONUS resources and outputs a Prime BEEF sourcing plan. This plan identifies Prime BEEF resources by CONUS MAJCOM, home station, and team combinations.

As seen in Figure 2-1, the Prime BEEF force designation developed through the force identification and selection process is used as an input, with all other

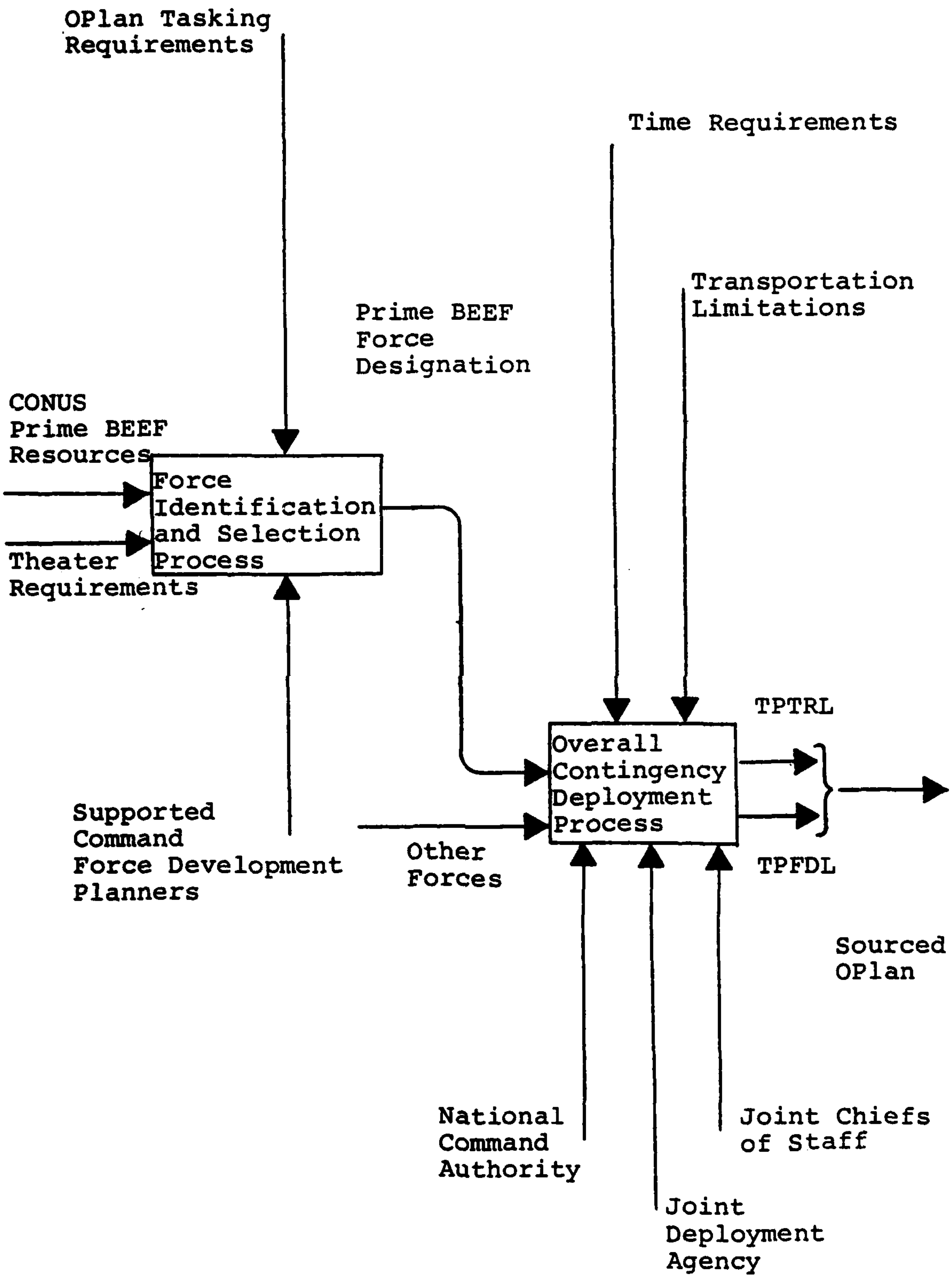


Fig. 2-1. Logic Flow of Prime BEEF Deployment Process

Air Force resources, into the overall deployment process. Based on these total force inputs and the constraints of the system, the OPlan requirements discussed in Chapter I are generated and fulfilled.

Based on the logic flow shown in Figure 2-1, the authors have followed the above "rules of thumb" described by Shannon regarding simplicity by modeling only the force-identification and selection process that identifies and tasks CONUS Prime BEEF resources. Figure 2-1 illustrates how this force-identification and selection process fits within the overall deployment system and how process results are used as inputs for the larger, more generic deployment system (Keen & Morton, 1978).

Data Preparation

Systems researchers must be concerned with "data regarding the inputs and outputs of the system . . . as well as the various components of the system [Shannon, 1975]."

The data for this model involves two inputs resulting in one output. CONUS Prime BEEF resources and theater Prime BEEF requirements are introduced, the decision process is applied, and a force-identification listing results. The output, the force-identification listing, designates, by MAJCOM and home station, the type of Prime BEEF team and its final destination.

This decision process is appropriate regardless of the scope of the contingency plan. Although the CONUS resources are fairly constant, the theater requirements will drive the allocation of the resources. As a result, the output also varies as theater requirements do. The model developed here incorporates these influences and is flexible enough to accept any force requirement from a limited contingency to a general, in-theater war.

Input Variables. Civil Engineering resources and requirements are listed in terms of Prime BEEF contingency force teams (CF teams). The general building block concept of Prime BEEF was discussed in Chapter I. Specific input data resources are shown in Table 2-1. These figures represent current levels of CONUS Prime BEEF forces available to support any contingency tasking.

Since this model emphasizes team integrity when selecting CONUS Prime BEEF teams, the CF-4 team, Command Staff Augmentation Team, is not included in Table 2-1. The CF-4 team is a specialized engineering team which provides staff augmentation support; deploying the CF-4 team with any other Prime BEEF team does not offer any team integrity advantage. For this reason the CF-4 team levels are not inserted as a CONUS resource.

Theater commanders initiate the deployment process when their planners establish the theater support force

TABLE 2-1

LEVELS OF CONUS PRIME BEEF RESOURCES

MAJCOM	CF-1	CF-2	CF-3	CF-5	CF-6
TAC	34	38	6	61	18
SAC	47	46	7	32	13
MAC	21	22	8	17	6
ATC	13	15	8	34	8
AFLC	9	11	14	4	1
AFSC	9	7	5	25	4
ANG/AFR	66	109	18	151	62
TOTALS	199	248	66	324	112

requirements. Obviously, the nature of the contingency scenario will dictate the characteristics of the CONUS reinforcement forces desired by the gaining theater command.

Output Variable. This model has one specific output variable--CONUS Prime BEEF teams allocated to deployed locations. This force allocation includes origin of force, team composition, and final deployment location. This output was studied under varying levels of force requirements.

Model Translation

A comprehensive list of factors to consider in selecting a simulation language may be found in Shannon's text, System Simulation, The Art and Science. The language

selected to model the decision process of Prime BEEF team designation was FORTRAN. FORTRAN was selected for a number of reasons. First, the FORTRAN language is available to major air commands under existing computer support or via contract (Moncure & White, 1982). Next, an extension of the American National Standards Institute (ANSI) FORTRAN language is available on AFIT computer facilities under the name FORTRAN VERSION 5. FORTRAN VERSION 5 includes new features over VERSION 4 that increase the power and portability of the language while adding little to its complexity. FORTRAN 5 allows increased user incorporation of input/output features, free use expressions, more versatile looping structures, and new IF-THEN-ELSE constructs that aid decision processes. This increased flexibility aided in identifying and modeling the decision process investigated. In general, FORTRAN 5 was readily available and relatively easy to use. A detailed verbal description of the FORTRAN program is included in Chapter III.

Model Manipulation

Once the model has been translated into a computer compatible format, verification and validation are required. It is necessary to manipulate the model in order to completely accomplish verification and validation. Additionally, tactical and strategic planning must be accomplished to ensure sound experimentation occurs.

Verification

The purpose of verification is "to insure that the model behaves as the experimenter intends [Shannon, 1975]." Output from FORTRAN 5 includes both diagnostic error and a tracing capability. Diagnostic error messages are useful when the manipulator is trying to isolate any errors that might occur during a run of the program. Diagnostic error messages indicate to the user where the error may have occurred.

The tracing methods employed in FORTRAN can be started or stopped as desired by the user. Event traces deal with activities in FORTRAN. That is, when an activity or calculation occurs, the resulting value is printed to allow the user to confirm the accuracy of the program. Thus, traces, in FORTRAN programming, are used to verify that activities are occurring within the model when and where they are intended.

Validation

Validation ensures that the model and the real system behave in the same fashion. Validation is extremely important because often simulations look real and their users find them easy to believe. However, since the simulation is composed of assumptions and simplistic design, many times the users and even the modelers do not recognize these assumptions. Therefore, if validation and evaluation

are not carried out, erroneous results may lead to invalid conclusions (Shannon, 1975).

No single, definitive test exists for validity. Rather, tests of validity may be satisfied to strengthen and substantiate the confidence of the user in the model. Shannon (1975) suggests three tests to use during model development: testing face validity, testing assumptions, and testing the input-output transformations that occur.

Face validity requires that the model and its basic processes be reasonable. Stage one is what Shannon (1975) calls a rationalist's approach. He notes that while "we do not insist upon . . . [unquestionable truth for our assumptions, we] . . . do require that the assumptions make sense." Our computer approach to the Prime BEEF sourcing decision process depends primarily upon the assumption that Prime BEEF integrity is a highly desirable result. Discussion of this research effort with previous and current MAJCOM planners reaffirmed this assumption as being a necessary but missing portion of current deployment planning (Bartlow, 1983; Eng, 1983; Evans, 1983). Face validity is also said to be confirmed when "the internal structure of the model is based upon *a priori* knowledge, past research, and existing theory [Shannon, 1975]." As discussed before, currently supported command planners rarely give the subject of Prime BEEF team integrity more than a passing effort. This is not because its value is

not recognized as important; rather it is because the current system does not incorporate that aspect of force planning. Comparisons of the model were made throughout its development with existing research, expert opinion, or personal experience to ensure that the model continued to perform in a reasonable manner.

Vigorous testing of the model's assumptions is the second test for validity. When possible, available historical data or system operations can be observed for testing validity. Unfortunately, neither of these two conditions exists. Historical data does indicate that the current system is lacking in the area of interest, Prime BEEF team integrity. As discussed in Chapter I, team integrity is an enhancement the system should have, and does not (USAF IG--FMI, 1982).

Analysis of the input-output transformation, the final stage of model validation, attempts to verify the model's ability to predict the behavior of the real world (Shannon, 1975). Unfortunately, data from the real world, based on our assumptions, is nonexistent. Additionally, data from the current system is classified and records are not kept which include how often team integrity actually enters into the planning process. Therefore, it was necessary to rely primarily on professional judgement and expert opinions throughout the modeling process.

Strategic Planning

Simulation is used to gain information about the real system. Therefore, to ensure that we obtain the results desired, strategic planning must occur. Strategic planning involves "how to design an experiment that will yield the desired information [Shannon, 1975]." Modeling the sourcing of Prime BEEF resources consisted of the simplest form of an experiment, one factor at one level (Shannon, 1975). The factor was the number of Prime BEEF team combinations sourced from a constant level of requirements. Because support force requirements for a European scenario involve classified material, a declassified requirements listing was provided by Headquarters Air Force Engineering and Services Center, Tyndall AFB, Florida (HQ AFESC/DEO). Although declassified, the requirements listing still provided representative deployment information for input into our decision model. This data included Prime BEEF team composition and "make-believe" deployment destination (AFR 28-3, 1979).

Tactical Planning

Tactical planning is solving the problems of starting conditions and sample size. Primarily, tactical planning is concerned with resolving two problem areas: (1) starting conditions and effects on equilibrium, and (2) variance reduction while minimizing sample sizes

(Shannon, 1975). Starting conditions for most simulations are critical, since relatively few real world situations occur when the simulated activity begins at an empty and idle state. Therefore, it is usually required to run the computer model for a length of time to achieve equilibrium conditions representative of the real world. However, the deployment process reflects a unique situation where the real life activity actually starts at an idle state. As a result, no additional computer time is required to achieve steady state. This aspect adds to computer efficiency, and data can be collected throughout the simulation as appropriate. Although force movements may be preplanned and predesignated, in real life situations the actual process is idle until initiated in the manner described in Chapter I. Additionally, because the decision process actually occurs before the deployment process begins, achievement of steady-state is not a requirement for this model.

Variance reduction and sample size are not considerations in this effort. The output of the FORTRAN 5 program is dependent upon the initial requirements input and the decision priorities established by the user. Based upon fixed requirements, various decision tasking priorities are applied to achieve selection of Prime BEEF resources while emphasizing team integrity. Since statistics are not kept, variance reduction techniques and sample size concerns do not affect this research effort.

Summary

This chapter provided a description of the simulation process, including the logic flow used for model formulation. Additionally, data preparation was performed and the initial parameters established in terms of simulating the decision process for designating CONUS reinforcement forces. Finally, the computer language, FORTRAN VERSION 5, was identified as the basis for model formulation. Face validity of the model took place using personal experience and expert opinion from MAJCOM force development planners.

The subsequent chapter describes the development of the model's logic and includes the same type of information Shannon (1975) describes as the experimentation stage. Finally, the last chapter includes discussion of what Shannon labels as the interpretation, implementation, and documentation stages.

CHAPTER III

MODEL FORMULATION AND MANIPULATION

Overview

The model formulated using the FORTRAN language to simulate the deployment tasking process is presented here. This chapter discusses the computer techniques used and the decision logic applied in formulating the development tasking model. Initially, the decision priorities which affect the identification of Prime BEEF resources during contingencies are identified. Next, the computer program is developed using the FORTRAN language to represent the decision priority sequence specified for the model. Additionally, the structured FORTRAN computer program is listed in Appendix B. Finally, verification techniques are applied to ensure the model does what it is designed.

Model Formulation

As described in Chapter II, the identification and tasking of CONUS Prime BEEF forces is the result of a decision process which examines specified requirements, evaluates existing resources, and then selects the resources to satisfy the requirements.

The decision process modeled here, for reasons discussed in Chapter I, incorporates Prime BEEF team integrity.

As discussed earlier, keeping CONUS base level Prime BEEF teams together from home station to the deployment location as much as possible ensures the maximum use of team capabilities. That is, the advantages of team integrity developed through home station training can be better realized (Eng, 1983). Air Force Regulation 93-3 (1982), states, "Prime BEEF teams may be tasked to augment existing in-theater . . . forces or to provide stand-alone civil engineering capability." Based on AFR 93-3, Air Force experts, and the authors' personal experience, the following decision sequence was specified for use in this model. This decision sequence makes full use of the advantages team integrity offers (AFR 93-3, 1982; Bartlow, 1983). This sequence, shown in Table 3-1, also establishes the logic flow used by the FORTRAN computer program to select CONUS Prime BEEF forces for assignment to deployment destinations.

TABLE 3-1

DECISION SEQUENCE PRIORITY

Number	Prime BEEF Teams Examined
1	CF-1, 2, 3, 5, and CF-6; for identical matches
2	CF-1, 2, and CF-3; any combination of teams
3	CF-5 and CF-6; any combination of teams
4	All remaining CF teams as required

This selection sequence was the basis for the decision model. If this priority sequence is applied within the deployment tasking process, resulting force selection incorporates the advantages of Prime BEEF team integrity. Though presented simply as a four-step sequence, these decision sequence priorities require further discussion.

Decision Sequence Priority One

This step determines how many, if any, CONUS bases have the exact number of Prime BEEF teams needed to satisfy base requirements within the deployment theater. If an identical match of resources to requirements occurs then that specific CONUS base and its respective Prime BEEF teams are assigned to fill the requirements specified at the deployment destination base. CONUS resources are searched to find this match of resources to requirements by checking each base available until either a match occurs or all resources have been examined. If no match of equality occurs then the resources are searched for either exact matches of CF-1, 2, and 3 teams, or matches of CF-5 and CF-6 teams. By establishing exact matches of resources to requirements, requirements are immediately filled and the separating of Prime BEEF teams from the same CONUS installation is minimized. This enhances the advantages gained from team integrity discussed in Chapter I.

Decision Sequence Priorities Two and Three

The primary advantages of team integrity as described in Chapter I, are derived from people training and working together. Steps two and three in this decision sequence also emphasize team integrity for allocating CONUS Prime BEEF resources. Since CF-1, 2, and CF-3 teams train together, as do CF-5 and CF 6 teams, team integrity is maintained when teams are sourced from the same CONUS base and deployed together to the same theater destination. Additionally, this study considers deployment of any combination of Prime BEEF teams from a CONUS location to the same theater destination to reflect the benefits of team integrity, provided the teams train together at their home station. That is, the deployment of a CF-1 and a CF-5 team does not represent team integrity sourcing because these teams do not train together for their contingency mission (AFR 93-3, 1982).

Decision Sequence Priority Four

Air Force Regulation 93-3 (1982) states that CONUS Prime BEEF teams will be deployed to augment existing theater civil engineering forces or in some cases provide "stand-alone" capability. Theater requirements sometimes require the allocation of single Prime BEEF teams or multiple combinations of single teams. Additionally, requirements may exceed resources if they have not been

satisfied using the decision sequences discussed above. In any case, the final step in this decision sequence satisfies whatever requirements remain from whatever source possible. This final step selects CONUS teams to fill all reamining requirements or identifies shortfalls if they occur.

Program Development

The input variables for this model, as discussed in Chapter II, are theater requirements and CONUS Prime BEEF resources. The Prime BEEF force identification and selection process modeled here incorporates these inputs and emphasizes team integrity when allocating CONUS resources to fulfill theater requirements.

The force identification and selection process model identifies the origin of CONUS forces and indicates where the Prime BEEF teams will be deployed. Modeled here, the process consists of nine basic subroutines. Each subroutine is similar in logic since the decision to assign resources in fulfillment of requirements is dependent upon what the requirements are for a particular theater base and which CONUS base can fill these requirements. Fulfillment of these requirements is accomplished using the four-step decision sequence described earlier in this chapter.

Each subroutine within the decision sequence uses team integrity as the basis for analysis. The FORTRAN

program analyzes theater requirements and searches existing CONUS resources until the requirement is satisfied or shortfalls identified. Once satisfied, a new requirement is identified and the selection process renewed. This iterative process requires the formulation of compatible data structures for both requirements and resources.

Data Structures

To compare, manipulate, and analyze large amounts of data more easily, FORTRAN allows the use of multi-dimensional arrays. An array can be thought of as a group of memory locations represented by a grid of boxes arranged as rows and columns. Two-dimensional arrays lend themselves for the storage and manipulation of data that are characterized by two attributes (Ageloff & Mojena, 1981). The two attributes that characterize the input variables of this model are (1) bases, both CONUS origin and theater destination, and (2) Prime BEEF type. Specifically, the two-dimensional arrays were structured to store data for this model. One array stored theater requirements and the other stored data representing existing CONUS Prime BEEF resources. Example data from each of these arrays is shown in Tables 3-2 and 3-3. As an example only, the following codes could apply to the data structure in Table 3-2.

1 = Home AFB AZ	T = TAC
2 = Good-bye AFB KS	S = SAC
3 = Where-am-I AFB SD	A = ATC
4 = Goodnight AFB HI	M = MAC
5 = Just Fine AFB ID	R = AFRES/ANG

TABLE 3-2

EXAMPLE OF CONUS RESOURCES DATA STRUCTURE

Base	MAJCOM	CF-1	CF-2	CF-3	CF-5	CF-6
1	R	1	2	1	3	1
2	S	0	3	2	4	2
3	A	1	1	3	1	2
4	M	3	0	1	0	1
5	T	5	2	1	1	1

TABLE 3-3

EXAMPLE OF THEATER REQUIREMENTS DATA STRUCTURE

Base	CF-1	CF-2	CF-3	CF-5	CF-6
1	0	2	0	1	0
2	1	1	0	1	1
3	1	2	0	0	0
4	0	1	1	0	0

As indicated before, the codes shown indicate the deployment destination and the numbers of Prime BEEF teams required at that destination. These two data bases store information about resources and requirements. The resources data structure includes identification of existing Air Force installations and the numbers of operational Prime BEEF teams. The data in this two-dimensional array are entered by the user and change only as the operational status of Prime BEEF teams changes. This data structure is then "searched" using FORTRAN logic statements to satisfy each specific requirement.

The requirements array identifies theater deployment destination bases and the number and type of reinforcement Prime BEEF teams required. As discussed in Chapter I, these requirements are derived by the supported command force development planners. Force development planners, as prospective users of this model, have the flexibility to configure the requirements array to meet any size of requirements. Similarly, the resources array can be manipulated to include only those resources desired.

Once these data structures are established, the computer program employs FORTRAN logic techniques to decide which resources satisfy which theater requirements. This force selection methodology emphasizes team integrity throughout the FORTRAN decision process.

FORTRAN Formulation

The FORTRAN computer program is included as Appendix B. Although the entire program is composed of several subprograms, the decision sequence described previously is modeled using nine basic subroutines. These routines perform the actual FORTRAN search used to match and specify the resource selected to support a requirement. The FORTRAN programming used in each subroutine is basically the same and each subroutine is discussed below.

Subroutine "EQ1to6"

Figure 3-1 shows the flowchart for the logic flow of subroutine "EQ1to6." In this subroutine the requirements data structure is examined to determine if any destination base has a requirement for one or more CF-1, 2, 3, 5, and CF-6 teams. If a requirement exists then the resource data structure is searched to find an exact match of resource to requirement. If an exact match is available then those CONUS forces are identified against that specific requirement. Once requirements are satisfied, both the resources and requirements data arrays are adjusted to reflect those resources are no longer available and the specific requirement no longer exists. However, if no exact match can be found, the program proceeds to the next decision routine. In the event there is no

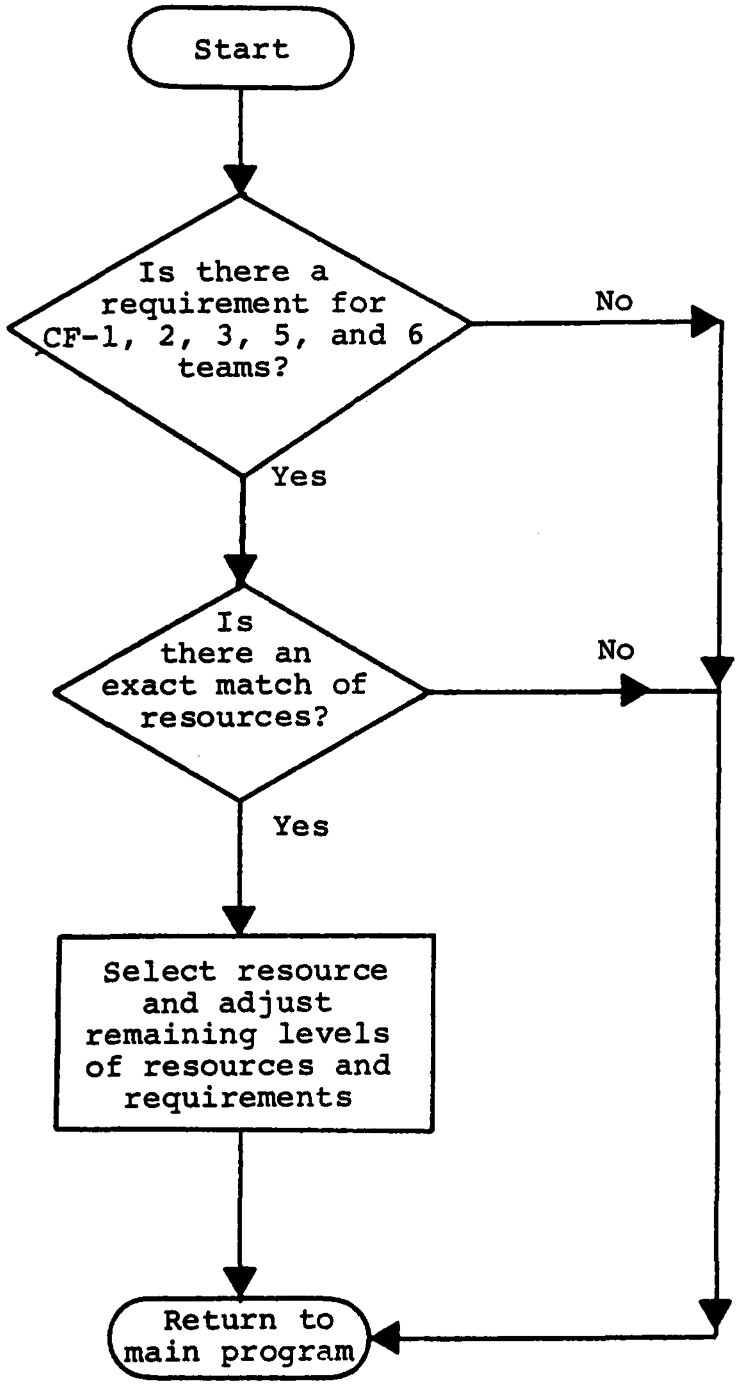


Fig. 3-1. Logic Flowchart for Subroutine "EQ1to6"

initial requirement of all five Prime BEEF team then the algorithm immediately continues to the next sequence in the decision process.

Subroutine "EQ123"

This routine, like the previous one, examines the theater data base for CF-1, 2, and CF-3 team requirements and subsequently sources CONUS resource to find an exact match if possible. If no match occurs then the decision process continues on to the next decision subroutine. However, if a match does occur then CONUS forces are allocated and both data bases are updated to reflect the decrease in available resources and the decrease in remaining requirements. As before, if no requirement exists for a CF-1, 2, and CF-3 team combination at any theater base then the program skips to the next appropriate decision sequence. The logic flowchart for this subroutine is exactly the same as Figure 3-1, except that only CF-1, 2, and CF-3 teams are being examined and selected.

Subroutine "GE123"

If exact matches of resources to requirements does not occur then this subroutine is called and used as the next decision selection routine. This routine searches the requirements data base and identifies bases where CF-1, 2, and CF-3 teams are needed. If this condition exists then the resources data structure is searched for

the first base which has any CF-1, 2, and CF-3 teams. Additionally, in this routine, the numbers of Prime BEEF teams must be less than or equal to the numbers required at the destination base. That is, if two CF-1 teams, one CF-2, and one CF-3 team are required in the deployment theater, then the resource base selected to fill these requirements must have the same numbers of forces or fewer. However, the base must have at least one of each required Prime BEEF team.

This selection method results in CONUS Prime BEEF teams being selected to deploy from their home station to the same theater destination while partially satisfying the theater requirement. The sourcing of as many teams as possible from each CONUS base retains some, if not all, of the advantages of team integrity. Again, if no requirement exists or if no resource qualifies for selection, then the program continues to the next routine. The logic flowchart of this sequence remains the same as Figure 3-1, but the emphasis is on CF-1, 2, and CF-3 theater requirements being larger than the CF-1, 2, and CF-3 resources.

Subroutine "GE12"

After CF-1, 2, and CF-3 team requirements are satisfied this subroutine examines the requirements for CF-1 and CF-2 Prime BEEF teams. Using the same logic described in subroutine "GE123," this routine establishes

the requirement, searches the resources, and selects resources if they exist and they are less than or equal to the requirements. Again, this decision process ensures that team integrity is incorporated by selecting the base which satisfies, at least partially, the destination requirements and deploying as many teams as possible from CONUS stations to deployment locations. Finally, each data structure is adjusted to reflect any changes and the iterative process continues to satisfy the next requirement. Logic flow is also represented by Figure 3-1.

Subroutine "Remainder"

As suggested by its name, this subroutine sources and selects resources to satisfy any remaining CF-1, 2, or CF-3 team requirements. The decision logic flow is similar to Figure 3-1. The requirements data structure, the two-dimensional array that has been updated after each sourcing, is examined row by row and column by column to establish remaining Prime BEEF requirements. As before, the resources data array is searched to find existing forces to satisfy any remaining requirements. Each remaining requirement is then identified and subsequently satisfied using the logical process described in earlier routines. However, if requirements exceed resources then corresponding shortfalls are identified.

Subroutine "EQ56"

Basically the same as subroutine "EQ123," the decision flowchart of this routine is similar to that in Figure 3-1. First, theater requirements for CF-5 and CF-6 teams are identified. Finally, the resources are searched for exact matches and if they occur the data structures are adjusted appropriately. This method of matching resources to requirements minimizes separation of CONUS Prime BEEF forces.

Subroutine "GE56"

This subroutine is identical to subroutine "GE123" except it evaluates the conditions where CF-5 and CF-6 team requirements exceed resources. As with "GE123," the CF-5 and CF-6 teams are sourced to help maintain team integrity while satisfying theater requirements.

Subroutine "GE5"

Once all CF-5 and CF-6 team requirements are examined using the "requirements exceed resources" approach, CF-5 and CF-6 requirements are evaluated and sourced using the CF-5 team requirement as the basis for comparison. That is, CONUS CF-5 and CF-6 teams are allocated against requirements when the CF-5 requirement equals or exceeds the available CF-5 resources. This methodology selects additional Prime BEEF teams from the same CONUS station to fill any remaining CF-5 and CF-6 requirements thereby

maintaining the advantage gained from the teams working and training together.

Subroutine "Remainder5"

At this point in the computer program, resources corresponding to requirements have already been designated for deployment to theater destinations. These selections include any exact matching that occurred as well as CONUS resources which were less than or equal to the requirements. Finally, this subroutine addresses all remaining CF-5 and CF-6 team requirements. This routine performs a function for CF-5 and CF-6 Prime BEEF forces identical to that described above in subroutine "Remainder." If shortfalls do exist they are noted here.

Using the logic of these nine subroutines, the FORTRAN computer program decides which CONUS Prime BEEF forces will fill which theater requirement. These subroutines, applied as the force-identification and tasking process, emphasize selecting and maintaining CONUS Prime BEEF teams from home station to deployment destination. Fulfilling theater requirements while emphasizing team integrity enables deployed Prime BEEF teams to take full advantage of the benefits that occur when people routinely work and train together.

Verification

The verification process was fully described in Chapter II. Event traces were conducted to ensure that each subroutine in the FORTRAN program manipulated the input data through the desired algorithm. Event tracing facilitated the rapid identification of any inherent problems in both the FORTRAN coding and the decision algorithm.

The Prime BEEF requirements and resources input data structures used during the verification process were developed by the authors. The authors elected to use two small input data structures to represent theater requirements and CONUS resources. Because the verification stage is needed only to demonstrate that the model behaves as designed, the use of large data structures would result in voluminous and unnecessary tracing outputs. However, a trace switch which allows the user to activate event tracing is included in the program to provide a complete tracing capability. The computer output resulting from the verification process is shown in Appendix C.

Summary

This chapter has addressed the formulation of the FORTRAN computer program used to model the deployment force-identification process used by command force developers to select CONUS Prime BEEF teams against theater requirements. The decision selection sequence was discussed and

the nine basic subroutines in the FORTRAN program were described. Additionally, the basic logic flow of the FORTRAN subroutines was presented and verification techniques discussed. The results, conclusions, and recommendations for this research effort are presented in the next chapter.

CHAPTER IV

RESULTS AND CONCLUSION

Results

Because of the classified nature of a wartime or contingency OPlan, the input data for the Prime BEEF force identification model were obtained from unclassified exercise working papers. The team configuration input data for Prime BEEF theater requirements were taken from an unclassified JOPS Force List/Movement Requirements Working Paper that the Air Force Engineering and Services Center (AFESC) used during a force deployment planning exercise. The team configuration input data for CONUS resources were also obtained from the AFESC. The input data for theater requirements were constructed by listing each theater base with its respective Prime BEEF team requirements. The CONUS resources were configured by listing each CONUS base and its respective Prime BEEF team composition and MAJCOM that is responsible for sourcing its teams. The input data processed through the model are shown in Appendix D.

The Prime BEEF team tasking matrices that are produced by the force-identification model are shown in Appendix E. The matrix headed by "Prime BEEF Team Tasking" identifies the CONUS base's MAJCOM, the CONUS and destination theater base, and the Prime BEEF team configuration

that deploys from the CONUS to theater base. The next several matrices identify by major command the Prime BEEF team configuration that deploys from a CONUS to a theater base. The final matrix headed by "Theater Shortfalls" lists the theater bases whose Prime BEEF requirements are not satisfied by existing CONUS resources.

Conclusion

The objective of this research was to develop a heuristic model which emphasized team cohesiveness throughout the Prime BEEF force-identification process. To accomplish this objective, this research asked the following question:

How can the Prime BEEF team tasking process be modeled so that team integrity is considered when Prime BEEF teams are designed to support OPlan mission objectives?

The force identification computer model that is developed and verified in this study represents one perspective of how the Prime BEEF forces identification process can occur if team cohesiveness is emphasized. Given the scope of this study, this force-identification model provides the heuristic framework which answers this study's research question.

Additionally, the Prime BEEF force-identification information that is produced by the model can provide the

supported contingency command planners with a quick, initial force requirements listing. This force requirements listing, which would contain the overall Prime BEEF team tasking matrix, the team taskings by MAJCOM, and theater shortfalls, can then be reviewed and coordinated by each supporting CONUS MAJCOM.

Recommendations

It is recommended that this force-identification model be sent to the AFESC to perform the three tests of model validity suggested by Shannon (1975): face validity, testing assumptions, and testing the input-output transformation. The computer services at the AFESC are cleared to process classified input data and maintain classified output information. Also, the ultimate users of this model, the theater and CONUS contingency planners, should be involved in the validation process.

In addition to identifying the need for improving the sourcing of Prime BEEF teams in support of an OPlan, the 1982 Functional Management Inspection observed that other components of the Prime BEEF deployment tasking system required investigation. Because of the uncertainties that prevail within the Prime BEEF deployment system, opportunities exist for additional research in this area. Specifically, the authors recommend the following:

1. The force-identification model demonstrated that it can generate the desired information through experimentation. However, several questions were left unanswered by this research. Given the input data, is there an "optimum" Prime BEEF force-identification configuration? How sensitive is the model to changes in the input variables and program algorithm? Does the model provide generic information useful to all contingency planners? The authors contend that questions referring to "how good" or "how much better" this model is can be answered only if the optimality issue is settled.

2. This model was developed as the first component in the complex Prime BEEF planned deployment system. The force-identification information serves as data input for the transportation deployment planning model. The transportation model determines whether the Prime BEEF deployment taskings dictated by the force-identification model can be accomplished within the required RDDs. Furthermore, the transportation model does not solely account for the transportation needs of Prime BEEF forces; the model must integrate the transportation requirements of all resources identified in an OPlan. Thus, it is recommended that further research be directed towards determining the feasibility of incorporating the force-identification model with the air transportation model. Hence, real-time

deployment management information would be available to the contingency planners.

Summary

The heuristic model developed in this research effort was intended to offer the CE contingency planning community a deployment management tool whereby team cohesiveness was emphasized during the identification and deployment of Prime BEEF forces. The products of the force-identification model provide planning information which supports the initial subset of the Prime BEEF deployment system.

The authors realize that other variables and constraints were not incorporated into this model. The importance of and emphasis shown by the Director of Engineering & Services for the deployment issue provides additional impetus for those concerned about Prime BEEF's ability to perform its wartime mission. The limitations of this model offer excellent opportunities for continued, active research in this area.

APPENDICES

APPENDIX A

PRIME BEEF CONTINGENCY STRUCTURE

Currently, the Prime BEEF structure uses the "building block" concept. This concept, described in Air Force Regulation 93-3 (1982), provides six types of contingency teams that build upon each other to create various combinations depending on mission requirements. These contingency teams are described below.

1. The CF-1 Team (Base Recovery and Operations Equipment Team) is a twenty-one-person team which provides the nucleus for expedient Rapid Runway Repair (RRR), and provides horizontal support for beddown and War Damage Repair (WDR).

2. The CF-2 Team (Base Recovery and Operations Support Team) supports the CF-1 team for Rapid Runway Repair; it supports force beddown, WDR, and Operations and Maintenance (O&M) activities. This is a seventy-person team.

3. The CF-3 Team (Base Recovery and Operations Augmentation Team) provides supplementary support to the CF-1 and CF-2 teams for continuing operations of WDR, O&M, and base development. A thirty-five-person team, the CF-3 team provides necessary management during continuing operations. These personnel, when formed up with CF-1 and CF-2 and fire fighters under a building block concept, provide a comprehensive base civil engineering capability.

Additionally, two CF-3 teams can support one CF-1 team for RRR.

4. The CF-4 Team (Command Staff Augmentation Team) is a twenty-person specialized engineering team comprised of senior NCOs and officers which provides staff augmentation support.

5. The CF-5 Team (Crash Rescue and Fire Suppression Operation Team) provides fire protection and crash rescue services. This twelve-person team are all fire fighters.

6. The CF-6 Team (Crash Rescue and Fire Suppression Control Team) is a three-person team which provides the command and control element in forming a fire department with CF-5 teams.

APPENDIX B

FORTRAN PROGRAM

This program was formulated for compilation and execution on the AFIT UNIX/VAX system. If this program will be run on other computer systems, modifications to the program may be required to allow for any differences that exist between the user's system and this one.

This program is designed to allocate and source CONUS resources based on any size of theater requirements that the user desires. However, the user must be aware that this requires manipulation of the size of the data structures. The following applies when modifying either of the data structures:

1. The requirements array, "DES," used in this program, must be dimensioned according to the size of theater requirements under consideration. For example, if the CONUS Prime BEEF forces are being searched to fulfill twenty-one theater bases then the requirements data array must be dimensioned to at least a 21 row x 6 column array. In this example, each row represents a theater base and each column contains the number of specific Prime BEEF teams required.

2. The same type of manipulation can be accomplished for the resources data structure. If the user does not wish to consider all available resources or wishes to source from only a select few resources then the resources array, "ORG," in this program, must be

dimensioned according to the number of resources actually included. As with the requirements array, each row in the resources array represents a CONUS Air Force installation and the columns indicate the numbers of available Prime BEEF teams at that specific base.

In addition to manipulating the resources and requirements data structures, the user may have to modify other items within this program to run the program on other systems.

```
      program thesis
c---------------------------------------------------------------------
      integer des(99,7),org(99,8),all(2,99,8)
      integer totd(1,7),toto(1,8),tota(1,8)
      integer trace1,trace2,ba,bas,base,z
      integer i,j,x,y
      common/block1/ba,bas,base
     *      /block2/des,org
     *      /block3/all
     *      /block4/z,trace1
     *      /block5/totd,toto,tota
c---------------------------------------------------------------------
      data z/0/
c---------------------------------------------------------------------
      open(10,file='des')
      rewind 10

      open(11,file='org')
      rewind 11

      open(12,file='bases')
      rewind 12
         read(12,*) ba,bas,base,trace1,trace2

      do 10 i=1,ba
        read(10,*)(des(i,j),j=1,6)
10    continue

      do 20 x=1,bas
        read(11,*)(org(x,y),y=1,7)
20    continue
c---------------------------------------------------------------------
      call totalr
      if(trace1.eq.1) then
         print'(//,22x,"T R A C E   R U N")'
         print'(22x,17("-"),////)'
      endif
      print'(//,15x,"ORIGINAL REQUIREMENTS AND RESOURCES")'
      print'(//,19x,"Theater Requirements")'
      print'(//,5x,"Theater",12x,"Prime BEEF Teams")'
      print'(7x,"Base",4x,"CF-1",4x,"CF-2",4x,"CF-3",4x,"CF-5",
     *        4x,"CF-6")'
      print 900
      do 30 i=1,ba
         print'(2x,4818)',(des(i,j),j=1,6)
30    continue
      print 900
      print'(5x,"TOTAL",4018,//)',(totd(1,j),j=2,6)
      print 1000
      print'(///,23x,"CONUS Resources")'
      print'(//,15x,"CONUS",13x,"Prime BEEF Teams")'
      print'(5x,"Command",3x,"Base",4x,"CF-1",4x,"CF-2",4x,"CF-3",
```

```
     *          4x,"CF-5",4x,"CF-6")'
            print 950
            do 40 x=1,bas
                print'(2x,48i8)',(org(x,y),y=1,7)
40          continue
            print 950
            print'(5x,"TOTAL",8x,40i8,//)',(toto(1,y),y=3,7)
            print 1000
            print 1000
            print'(1x,//////////,1x)'
c-----------------------------------------------------------------
            call eqlto6
c
            call totalr
c
            if(tracel.eq.1) then
               print'(/,"Equality Among Teams")'
               call printr
            endif
c-----------------------------------------------------------------
           call eql23
c
           call totalr
c
           if(tracel.eq.1) then
               print'(/,5x,"Equality Among PB teams 1,2,3")'
               call printr
           endif
c
           call sortr
c-----------------------------------------------------------------
           call gel23
c
           call totalr
c
           if(tracel.eq.1) then
               print'(/,5x,"Greater Than or Equal to PB 1,2,3 Teams")'
               call printr
           endif
c
           call sortr
c-----------------------------------------------------------------
           call gel2
c
           call totalr
c
           if(tracel.eq.1) then
               print'(/,5x,"Greater Than or Equal to PB 1,2 Teams")'
               call printr
           endif
c
           call sortr
```

```
c-----------------------------------------------------------------
      call remdr
c
      call totalr
c
      if(tracel.eq.1) then
          print'(/,5x,"All PB 1,2,3 Teams")'
          call printr
      endif
c
      call sortr
c-----------------------------------------------------------------
      call eq56
c
      call totalr
c
      if(tracel.eq.1) then
          print'(/,5x,"Equal PB 5,6 Teams")'
          call printr
      endif
c
      call sortr5
c-----------------------------------------------------------------
      call ge56
c
      call totalr
c
      if(tracel.eq.1) then
          print'(/,5x,"Greater Than or Equal PB 5,6 Teams")'
          call printr
      endif
c
      call sortr5
c-----------------------------------------------------------------
      call ge5
c
      call totalr
c
      if(tracel.eq.1) then
          print'(/,5x,"Greater Than or Equal PB 5 Team")'
          call printr
      endif
c
      call sortr5
c-----------------------------------------------------------------
      call remdr5
c
      call totalr
c
      if(tracel.eq.1) then
          print'(/,5x,"All PB 5,6 Teams")'
          call printr
```

```
      endif
c-----------------------------------------------------------------
      call final
c-----------------------------------------------------------------
900   format(5x,46("-"))
950   format(5x,55("-"))
1000  format(/,62("-"))
c
      stop
c
      end
c-----------------------------------------------------------------
c-----------------------------------------------------------------
c
c                    Subroutine Total
c
c-----------------------------------------------------------------
      subroutine totalr

      integer totd(1,7),toto(1,8),tota(1,8)
      integer des(99,7),org(99,8),all(2,99,8)
      integer ba,bas,base,i,x,y,a,b

      common/block1/ba,bas,base
     *      /block2/des,org
     *      /block3/all
     *      /block5/totd,toto,tota
c-----------------------------------------------------------------
      do 5 y=1,7
          totd(1,y) = 0
5     continue
      do 10 y=1,8
          toto(1,y) = 0
          tota(1,y) = 0
10    continue
c-----------------------------------------------------------------
      do 20 i=1,ba
          totd(1,2) = totd(1,2) + des(i,2)
          totd(1,3) = totd(1,3) + des(i,3)
          totd(1,4) = totd(1,4) + des(i,4)
          totd(1,5) = totd(1,5) + des(i,5)
          totd(1,6) = totd(1,6) + des(i,6)
20    continue
c-----------------------------------------------------------------
      do 30 x=1,bas
          toto(1,3) = toto(1,3) + org(x,3)
          toto(1,4) = toto(1,4) + org(x,4)
          toto(1,5) = toto(1,5) + org(x,5)
          toto(1,6) = toto(1,6) + org(x,6)
          toto(1,7) = toto(1,7) + org(x,7)
30    continue
c-----------------------------------------------------------------
```

```
      do 40 a=1,base
          do 50 b=1,2
              tota(1,4) = tota(1,4) + all(b,a,4)
              tota(1,5) = tota(1,5) + all(b,a,5)
              tota(1,6) = tota(1,6) + all(b,a,6)
              tota(1,7) = tota(1,7) + all(b,a,7)
              tota(1,8) = tota(1,8) + all(b,a,8)
50        continue
40    continue
      return
      end
c-----------------------------------------------------------------
c
c                    Subroutine Print
c
c-----------------------------------------------------------------
      subroutine printr
c
      integer ba,bas,base,i,j,x,y,z,a,b
      integer des(99,7),org(99,8),all(2,99,8)
      integer totd(1,7),toto(1,8),tota(1,8)
      common/block1/ba,bas,base
     *      /block2/des,org
     *      /block3/all
     *      /block4/z,tracel
     *      /block5/totd,toto,tota
c-----------------------------------------------------------------
      print'(//,19x,"Theater Requirements")'
      print'(//,5x,"Theater",12x,"Prime BEEF Teams")'
      print'(7x,"Base",4x,"CF-1",4x,"CF-2",4x,"CF-3",4x,"CF-5",
     *       4x,"CF-6")'
      print 900
      do 30 i=1,ba
          print'(2x,48i8)',(des(i j),j=1,6)
30    continue
      print 900
      print'(5x,"TOTAL",32i8,//)',(totd(1,j),j=2,6)
c-----------------------------------------------------------------
      print'(//,26x,"CONUS Resources")'
      print'(//,15x,"CONUS",13x,"Prime BEEF Teams")'
      print'(5x,"Command",3x,"Base",4x,"CF-1",4x,"CF-2",4x,"CF-3",
     *       4x,"CF-5",4x,"CF-6")'
      print 950
      do 40 x=1,bas
          print'(2x,48i8)',(org(x,y),y=1,7)
40    continue
      print 950
      print'(5x,"TOTAL",8x,40i8,//)',(toto(1,y),y=3,7)
c-----------------------------------------------------------------
      print'(//,22x,"Prime BEEF Team Tasking")'
      print'(//,13x,"Theater",3x,"CONUS",10x,"Prime BEEF Teams")'
      print'(5x,"Command",3x,"Base",4x,"Base",4x"CF-1",4x,"CF-2",
```

```
     *        4x,"CF- 3",4x,"CF-5",4x,"CF-6")'
        print 1000
        if(z.le.99) then
            do 50 a=1,base
                print'(2x,64i8)',(all(1,a,b),b=1,8)
50          continue
        endif
        if(z.gt.99) then
            do 60 a=1,base
                print'(2x,64i8)',(all(1,a,b),b=1,8)
60          continue
            do 70 a=1,base
                print'(2x,64i8)',(all(2,a,b),b=1,8)
70          continue
        endif
        print 1000
        print'(5x,"TOTAL",16x,40i8,//)',(tota(1,b),b=4,8)
        print 1050
        print 1050
900     format(5x,46("-"))
950     format(5x,54("-"))
1000    format(5x,62("-"))
1050    format(/,62("-"))
        return
        end
c-----------------------------------------------------------------------
c
c                       Subroutine Sort
c
c-----------------------------------------------------------------------
        subroutine sortr
c
        integer ba,bas,i,j,x,y,k
        integer switch,temp(1,7),des(99,7),org(99,8)
        common/block1/ba,bas,base
     *       /block2/des,org
c-----------------------------------------------------------------------
        do 10 i=1,ba
            des(i,7) = des(i,2) + des(i,3) + des(i,4)
10      continue
c-----------------------------------------------------------------------
        switch = 1
c-----------------------------------------------------------------------
20      if(switch.eq.1) then
            switch = 0
            do 30 i=2,ba
                k = i - 1
                if(des(i,7).gt.des(k,7)) then
                    do 25 j=1,7
                    temp(1,j) = des(i,j)
                    des(i,j) = des(k,j)
                    des(k,j) = temp(1,j)
```

```
                switch = 1
25              continue
            endif
30        continue
          go to 20
      endif
c-----------------------------------------------------------------
      do 50 x=1,bas
          org(x,8) = org(x,3) + org(x,4) + org(x,5)
50    continue
c-----------------------------------------------------------------
      switch = 1
c-----------------------------------------------------------------
60    if(switch.eq.1) then
          switch = 0
          do 70 x=2,bas
              k = x - 1
              if(org(x,8).gt.org(k,8)) then
                  do 65 y=1,8
                      temp(1,y) = org(x,y)
                      org(x,y) = org(k,y)
                      org(k,y) = temp(1,y)
                      switch = 1
65                continue
              endif
70        continue
          go to 60
      endif
c-----------------------------------------------------------------
      return
      end
c-----------------------------------------------------------------
c
c                        Subroutine Sortr5
c
c-----------------------------------------------------------------
      subroutine sortr5

      integer ba,bas,i,j,x,y,k
      integer switch,temp(1,7),des(99,7),org(99,8)
      common/block1/ba,bas,base
     *      /block2/des,org
c-----------------------------------------------------------------
      switch = 1
c-----------------------------------------------------------------
      do 25 i=1,ba
          des(i,7) = des(i,5) + des(i,6)
25    continue
c-----------------------------------------------------------------
30    if(switch.eq.1) then
          switch = 0
          do 10 i=2,ba
```

```
               k = i - 1
               if(des(i,7).gt.des(k,7)) then
                   do 20 j=1,7
                       temp(1,j) = des(i,j)
                       des(i,j) = des(k,j)
                       des(k,j) = temp(1,j)
                       switch = 1
20                 continue
               endif
10         continue
           go to 30
       endif
c-----------------------------------------------------------------------
       switch = 1
c-----------------------------------------------------------------------
       do 45 x=1,bas
           org(x,8) = org(x,6) + org(x,7)
45     continue
c-----------------------------------------------------------------------
70     if(switch.eq.1) then
           switch = 0
           do 50 x=2,bas
               k = x - 1
               if(org(x,8).gt.org(k,8)) then
                   do 60 y=1,8
                       temp(1,y) = org(x,y)
                       org(x,y) = org(k,y)
                       org(k,y) = temp(1,y)
                       switch = 1
60                 continue
               endif
50         continue
           go to 70
       endif
c-----------------------------------------------------------------------
       return
       end
c-----------------------------------------------------------------------
c
c                        Subroutine Remainder
c
c-----------------------------------------------------------------------

       subroutine remdr

       integer ba,bas,i,j,k,x,y,z,v,n,tracel
       integer des(99,7),org(99,8),all(2,99,8)
       common/block1/ba,bas,base
     *       /block2/des,org
     *       /block3/all
     *       /block4/z,tracel
c-----------------------------------------------------------------------
```

```
      if(tracel.eq.1) then
          print'(//,16x,"Traces for All PB 1,2,3 Teams",/)'
      endif
      do 10 i=1,ba
          if((des(i,2).eq.0).and.(des(i,3).eq.0).and.
     *      (des(i,4).eq.0)) then
              go to 10
          endif
          do 20 x=1,bas
              n = 0
              do 30 j=2,4
                  k = j + 1
                  if((des(i,j).gt.0).and.(org(x,k).gt.0)) then
                      n = n + 1
                  endif
30            continue
              if(n.eq.0) then
                  go to 20
              endif
              z = z + 1
              if(z.le.99) then
                  all(1,z,1) = org(x,1)
                  all(1,z,2) = des(i,1)
                  all(1,z,3) = org(x,2)
                  do 40 y = 2,4
                      k = y + 1
                      v = k + 1
                      if(des(i,y).eq.org(x,k)) then
                          all(1,z,v) = org(x,k)
                          des(i,y) = 0
                          org(x,k) = 0
                      elseif(des(i,y).gt.org(x,k)) then
                          all(1,z,v) = org(x,k)
                          des(i,y) = des(i,y) - org(x,k)
                          org(x,k) = 0
                      else
                          all(1,z,v) = des(i,y)
                          org(x,k) = org(x,k) - des(i,y)
                          des(i,y) = 0
                      endif
40                continue
              if(tracel.eq.1) then
                  print'(5x,"Match no.",i3)',z
                  print'(5x,"Theater base -",i3)',des(i,1)
                  print'(5x,"CONUS base -",i3)',org(x,2)
                  print'(" ")'
              endif
              else
                  all(2,z,1) = org(x,1)
                  all(2,z,2) = des(i,1)
                  all(2,z,3) = org(x,2)
                  do 50 y = 5,6
```

```
                k = y + 1
                v = k + 1
                if(des(i,y).eq.org(x,k)) then
                    all(2,z,v) = org(x,k)
                    des(i,y) = 0
                    org(x,k) = 0
                elseif(des(i,y).gt.org(x,k)) then
                    all(2,z,v) = org(x,k)
                    des(i,y) = des(i,y) - org(x,k)
                    org(x,k) = 0
                else
                    all(1,z,v) = des(i,y)
                    org(x,k) = org(x,k) - des(i,y)
                    des(i,y) = 0
                endif
50          continue
            if(tracel.eq.1) then
                print'(5x,"Match no.",i3)',z
                print'(5x,"Theater base -",i3)',des(i,1)
                print'(5x,"CONUS base -",i3)',org(x,2)
            endif
        endif
        if((des(i,2).eq.0).and.(des(i,3).eq.0).and.
     *     (des(i,4).eq.0)) then
            go to 10
        endif
20    continue
10    continue
      return
      end
c-----------------------------------------------------------------
c
c                Subroutine Remainder 5
c
c-----------------------------------------------------------------
      subroutine remdr5

      integer ba,bas,i,j,k,x,y,z,v,n,tracel,a,b
      integer des(99,7),org(99,8),all(2,99,8)
      common/block1/ba,bas,base
     *      /block2/des,org
     *      /block3/all
     *      /block4/z,tracel
c-----------------------------------------------------------------
      do 10 i=1,ba
        if((des(i,5).eq.0).and.(des(i,6).eq.0)) then
            go to 10
        endif
        do 20 x=1,bas
            n = 0
            do 30 j = 5,6
                k = j + 1
```

```
                if((des(i,j).gt.0).and.(org(x,k).gt.0)) then
                    n = n + 1
                endif
30          continue
            if(n.eq.0) then
                go to 20
            endif
            z = z + 1
            if(z.le.99) then
                a = 1
                b = z
            else
                a = 2
                b = z - 99
            endif
            all(a,b,1) = org(x,1)
            all(a,b,2) = des(i,1)
            all(a,b,3) = org(x,2)
            do 40 y=5,6
                k = y + 1
                v = k + 1
                if(des(i,y).eq.org(x,k)) then
                    all(a,b,v) = org(x,k)
                    des(i,y) = 0
                    org(x,k) = 0
                elseif(des(i,y).gt.org(x,k)) then
                    all(a,b,v) = org(x,k)
                    des(i,y) = des(i,y) - org(x,k)
                    org(x,k) = 0
                else
                    all(a,b,v) = des(i,y)
                    org(x,k) = org(x,k) - des(i,y)
                    des(i,y) = 0
                endif
40          continue
            if(tracel.eq.1) then
                print'(5x,"Match no.",i3)',z
                print'(5x,"Theater base -",i3)',des(i,1)
                print'(5x,"CONUS base -",i3)',org(x,2)
            endif
            if((des(i,5).eq.0).and.(des(i,6).eq.0)) then
                go to 10
            endif
20        continue
10      continue
1000    format(/,47("-"))
        return
        end
```

```
c-----------------------------------------------------------------
c
c                       Subroutine Final
c
c-----------------------------------------------------------------
        subroutine final

        integer i,j,k,base,a,b
        integer totd(1,7),toto(1,8),tota(1,8),all(2,99,8)
        common/block1/ba,bas,base
     *       /block3/all
     *       /block5/totd,toto,tota
c-----------------------------------------------------------------
        print 1000
        print'(22x,"FINAL PRIME BEEF TEAM TASKING")'
        print'(//,13x,"Theater",3x,"CONUS",10x,"Prime BEEF Teams")'
        print'(5x,"Command",3x,"Base",4x,"Base",4x,"CF-1",4x,"CF-2",
     *       4x,"CF-3",4x,"CF-5",4x,"CF-6")'
        print 950
        do 10 a=1,base
           print'(2x,64i8)',(all(1,a,b),b=1,8)
10      continue
        do 20 a=1,base
           print'(2x,64i8)',(all(2,a,b),b=1,8)
20      continue
        print 950
        print'(5x,"TOTAL",16x,40i8,//)',(tota(1,b),b=4,8)
        print 1000
        print 1000
        print'(17x,"PRIME BEEF TEAM TASKING BY THEATER BASE")'
        print'(//,5x,"Theater",3x,"CONUS",11x,"Prime BEEF Teams")'
        print'(7x,"Base",4x,"Base",4x,"CF-1",4x,"CF-2",4x,
     *       "CF-3",4x,"CF-5",4x,"CF-6")'
        print 900
        do 30 i=1,base
           do 40 j=1,base
              if(all(1,j,2).eq.i) then
                 print'(2x,56i8)',(all(1,j,k),k=2,8)
              endif
              if(all(2,j,2).eq.i) then
                 print'(2x,56i8)',(all(2,j,k),k=2,8)
              endif
40         continue
           print'(" ")'
30      continue
        print 900
        print'(5x,"TOTAL",8x,40i8)',(tota(1,x),x=4,8)
        print 1000
        print'(18x,"PRIME BEEF TEAM TASKING BY CONUS BASE")'
        print'(//,15x,"CONUS",2x,"Theater",10x,"Prime BEEF Team")'
        print'(5x,"Command",3x,"Base",4x,"Base",4x,"CF-1",4x,"CF-2",
     *       4x,"CF-3",4x,"CF-5",4x,"CF-6")'
```

```
      print 950
      do 50 i=1,base
          do 60 j=1,base
              if(all(1,j,3).eq.i) then
                  print 100,all(1,j,1),all(1,j,3),all(1,j,2),
     *                  all(1,j,4),all(1,j,5),all(1,j,6),
     *                  all(1,j,7),all(1,j,8)
              endif
              if(all(2,j,3).eq.i) then
                  print 100,all(2,j,1),all(2,j,3),all(2,j,2),
     *                  all(2,j,4),all(2,j,5),all(2,j,6),
     *                  all(2,j,7),all(2,j,8)
              endif
60        continue
          print'(" ")'
50    continue
      print 950
      print'(5x,"TOTAL",16x,40i8)',(tota(1,x),x=4,8)
      print 1000
      print 1000
      do 70 i=1,7
          print'(13x,"PRIME BEEF TEAM TASKING:  MAJCOM -",i2,/)',i
          print'(3x,"Theater",3x,"CONUS",10x,"Prime BEEF Team")'
          print'(5x,"Base",4x,"Base",4x,"CF-1",4x,"CF-2",
     *           4x,"CF-3",4x,"CF-5",4x,"CF-6")'
          print 900
          do 80 j=1,base
              if(all(1,j,1).eq.i) then
                  print'(64i8)',(all(1,j,k),k=2,8)
              endif
              if(all(2,j,1).eq.i) then
                  print'(64i8)',(all(2,j,k),k=2,8)
              endif
80        continue
          print 1000
70    continue
100   format(8x,i2,6x,i2,6x,i2,6x,i2,6x,i2,6x,i2,6x,i2,6x,i2)
900   format(4x,57("-"))
950   format(5x,61("-"))
1000  format(//,62("-"),//)
      return
      end
c-----------------------------------------------------------------
c
c                    Subroutine EQlTO6
c
c-----------------------------------------------------------------
      subroutine eqlto6

      integer ba,bas,i,j,x,y,z,a,b,tracel
      integer des(99,7),org(99,8),all(2,99,8)
      common/blockl/ba,bas,base
```

```
     *         /block2/des,org
     *         /block3/all
     *         /block4/z,tracel
c------------------------------------------------------------------
      if(tracel.eq.1) then
          print'(//,16x,"Traces for EQ1T06",/)'
      endif
      do 50 i=1,ba
          do 60 j=1,6
              if(des(i,j).eq.0) then
                   go to 50
              endif
60        continue
          do 70 x=1,bas
              if(des(i,2).eq.org(x,3).and.des(i,3).eq.org(x,4).and.
     *        des(i,4).eq.org(x,5).and.des(i,5).eq.org(x,6).and.
     *        des(i,6).eq.org(x,7)) then
                  z = z + 1
                  if(z.le.99) then
                      a = 1
                      b = z
                  else
                      a = 2
                      b = z - 99
                  endif
                  all(a,b,1) = org(x,1)
                  all(a,b,2) = des(i,1)
                  all(a,b,3) = org(x,2)
                  all(a,b,4) = des(i,2)
                  all(a,b,5) = des(i,3)
                  all(a,b,6) = des(i,4)
                  all(a,b,7) = des(i,5)
                  all(a,b,8) = des(i,6)
                  if(tracel.eq.1) then
                      print'(5x,"Match no.",i3)',z
                      print'(5x,"Theater base - ",i2)',des(i,1)
                      print'(5x,"CONUS base - ",i2,/)',org(x,2)
                  endif
                  do 90 j=2,6
                       des(i,j)=0
90                continue
                  do 100 y=3,7
                       org(x,y)=0
100               continue
                  go to 50
              endif
70        continue
50    continue
      return
      end
c------------------------------------------------------------------
c
```

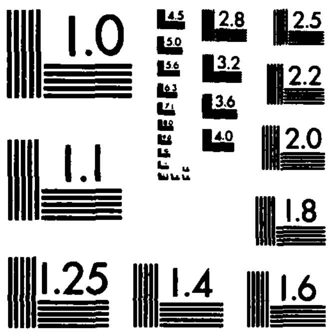
```
c                          Subroutine EQ123
c
c-----------------------------------------------------------------
      subroutine eq123

      integer ba,bas,i,j,x,y,z,a,b,tracel
      integer des(99,7),org(99,8),all(2,99,8)
      common/block1/ba,bas,base
     *       /block2/des,org
     *       /block3/all
     *       /block4/z,tracel
c-----------------------------------------------------------------
      if(tracel.eq.1) then
          print'(//,16x,"Traces for EQ123",/)'
      endif
      do 110 i=1,ba
          do 120 j=2,4
              if(des(i,j).eq.0) then
                  go to 110
              endif
120       continue
          do 130 x=1,bas
              if(des(i,2).eq.org(x,3).and.des(i,3).eq.org(x,4).and.
     *        des(i,4).eq.org(x,5)) then
                  z = z + 1
                  if(z.le.99) then
                      a = 1
                      b = z
                  else
                      a = 2
                      b = z - 99
                  endif
                  all(a,b,1) = org(x,1)
                  all(a,b,2) = des(i,1)
                  all'a,b,3) = org(x,2)
                  all(a,b,4) = des(i,2)
                  all(a,b,5) = des(i,3)
                  all(a,b,6) = des(i,4)
                  if(tracel.eq.1) then
                      print'(5x,"Match no.",i3)',z
                      print'(5x,"Theater base - ",i2)',des(i,1)
                      print'(5x,"CONUS base - ",i2,/)',org(x,2)
                  endif
                  do 150 j=2,4
                      des(i,j)=0
150               continue
                  do 160 y=3,5
                      org(x,y)=0
160               continue
                  go to 110
              endif
130       continue
```

```
110     continue
        return
        end
c-------------------------------------------------------------------
c
c                       Subroutine GE123
c
c-------------------------------------------------------------------
        subroutine ge123

        integer ba,bas,i,x,y,z,a,b,tracel
        integer des(99,7),org(99,8),all(2,99,8)
        common/block1/ba,bas,base
     *       /block2/des,org
     *       /block3/all
     *       /block4/z,tracel
c-------------------------------------------------------------------
        if(tracel.eq.1) then
            print'(//,16x,"Traces for GE123",/)'
        endif
        do 200 i=1,ba
            if((des(i,2).eq.0).and.(des(i,3).eq.0).and.
     *        (des(i,4).eq.0)) then
                go to 200
            endif
            do 210 x=1,bas
                if((org(x,3).eq.0).and.(org(x,4).eq.0).and.
     *            (org(x,5).eq.0)) then
                    go to 210
                endif
                if((des(i,2).ge.org(x,3)).and.(des(i,3).ge.org(x,4))
     *            .and.(des(i,4).ge.org(x,5))) then
                    z = z + 1
                    if(z.le.99) then
                        a = 1
                        b = z
                    else
                        a = 2
                        b = z - 99
                    endif
                    all(a,b,1) = org(x,1)
                    all(a,b,2) = des(i,1)
                    all(a,b,3) = org(x,2)
                    all(a,b,4) = org(x,3)
                    all(a,b,5) = org(x,4)
                    all(a,b,6) = org(x,5)
                    des(i,2) = des(i,2) - org(x,3)
                    des(i,3) = des(i,3) - org(x,4)
                    des(i,4) = des(i,4) - org(x,5)
                    if(tracel.eq.1) then
                        print'(5x,"Match no.",i3)',z
                        print'(5x,"Theater base - ",i2)',des(i,1)
```

```
                    print'(5x,"CONUS base - ",i2,/)',org(x,2)
                endif
                do 230 y=3,5
                    org(x,y) = 0
230             continue
                go to 200
            endif
210     continue
200   continue
      return
      end
c-----------------------------------------------------------------
c
c                     Subroutine GE12
c
c-----------------------------------------------------------------
      subroutine ge12

      integer ba,bas,i,x,z,temorg(1,8),a,b,tracel
      integer des(99,7),org(99,8),all(2,99,8)
      common/block1/ba,bas,base
     *      /block2/des,org
     *      /block3/all
     *      /block4/z,tracel
c-----------------------------------------------------------------
      if(tracel.eq.1) then
          print'(//,16x,"Traces for GE12",/)'
      endif
      do 300 i=1,ba
          if((des(i,2).eq.0).and.(des(i,3).eq.0).and.
     *       (des(i,4).eq.0).and.(des(i,5).eq.0).and.
     *       (des(i,6).eq.0)) then
              go to 300
          endif
          do 310 x=1,bas
              if((org(x,3).eq.0).and.(org(x,4).eq.0).and.
     *           (org(x,5).eq.0)) then
                  go to 310
              endif
              if((des(i,2).ge.org(x,3)).and.(des(i,3).ge.org(i,4)))
     *           then
                  z = z + 1
                  if(des(i,4).gt.0) then
                      temorg(x,5) = des(i,4)
                  else
                      temorg(x,5) = 0
                  endif
                  if(z.le.99) then
                      a = 1
                      b = z
                  else
                      a = 2
```

AD-A134 996 A HEURISTIC FORTRAN MODEL OF THE IDENTIFICATION AND ALLOCATION OF CONUS (..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 2/2

UNCLASSIFIED N K KANNO ET AL. SEP 83 AFIT-LSSR-80-83 F/G 15/5 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
                b = z - 99
            endif
            all(a,b,1) = org(x,1)
            all(a,b,2) = des(i,1)
            all(a,b,3) = org(x,2)
            all(a,b,4) = org(x,3)
            all(a,b,5) = org(x,4)
            all(a,b,6) = temorg(x,5)
            des(i,2) = des(i,2) - org(x,3)
            des(i,3) = des(i,3) - org(x,4)
            org(x,3) = 0
            org(x,4) = 0
            org(x,5) = org(x,5) - des(i,4)
            des(i,4) = 0
            if(tracel.eq.1) then
                print'(5x,"Match no.",i3)',z
                print'(5x,"Theater base - ",i2)',des(i,1)
                print'(5x,"CONUS base - ",i2,/)',org(x,2)
            endif
            go to 300
        endif
310     continue
300   continue
      return
      end
c-------------------------------------------------------------------
c
c                    Subroutine EQ56
c
c-------------------------------------------------------------------
      subroutine eq56

      integer ba,bas,i,j,x,y,z,a,b,tracel
      integer des(99,7),org(99,8),all(2,99,8)
      common/block1/ba,bas,base
     *       /block2/des,org
     *       /block3/all
     *       /block4/z,tracel
c-------------------------------------------------------------------
      if(tracel.eq.1) then
          print'(//,16x,"Traces for EQ56",/)'
      endif
      do 500 i=1,ba
          do 510 j=5,6
              if(des(i,j).eq.0) then
                  go to 500
              endif
510       continue
          do 520 x=1,bas
              if((des(i,5).eq.org(x,6)).and.(des(i,6).eq.org(x,7)))
     *          then
                  z = z + 1
```

```
                    if(z.le.99) then
                        a = 1
                        b = z
                    else
                        a = 2
                        b = z - 99
                    endif
                    all(a,b,1) = org(x,1)
                    all(a,b,2) = des(i,1)
                    all(a,b,3) = org(x,2)
                    all(a,b,7) = org(x,6)
                    all(a,b,8) = org(x,7)
                    do 530 j=5,6
                        des(i,j) = 0
530                 continue
                    do 540 y=6,7
                        org(x,y) = 0
540                 continue
                    if(tracel.eq.1) then
                        print'(5x,"Match no.",i3)',z
                        print'(5x,"Theater base - ",i2)',des(i,1)
                        print'(5x,"CONUS base - ",i2,/)',org(x,2)
                    endif
                    go to 500
                endif
520         continue
500     continue
        return
        end
c-----------------------------------------------------------------
c
c                       Subroutine GE56
c
c-----------------------------------------------------------------
        subroutine ge56

        integer ba,bas,i,x,z,a,b,tracel
        integer des(99,7),org(99,8),all(2,99,8)
        common/block1/ba,bas,base
     *        /block2/des,org
     *        /block3/all
     *        /block4/z,tracel
c-----------------------------------------------------------------
        if(tracel.eq.1) then
            print'(//,16x,"Traces for GE56",/)'
        endif
        do 600 i=1,ba
            if(des(i,5).eq.0) then
                go to 600
            endif
            do 610 x=1,bas
                if((org(x,6).eq.0).and.(org(x,7).eq.0)) then
```

```
                go to 610
            endif
            if((des(i,5).ge.org(x,6)).and.(des(i,6).ge.org(x,7)))
     *        then
                z = z + 1
                if(z.le.99) then
                    a = 1
                    b = z
                else
                    a = 2
                    b = z - 99
                endif
                all(a,b,1) = org(x,1)
                all(a,b,2) = des(i,1)
                all(a,b,3) = org(x,2)
                all(a,b,7) = org(x,6)
                all(a,b,8) = org(x,7)
                des(i,5) = des(i,5) - org(x,6)
                des(i,6) = des(i,6) - org(x,7)
                org(x,6) = 0
                org(x,7) = 0
                if(tracel.eq.1) then
                    print'(5x,"Match no.",i3)',z
                    print'(5x,"Theater base - ",i2)',des(i,1)
                    print'(5x,"CONUS base - ",i2,/)',org(x,2)
                endif
                go to 600
            endif
610       continue
600     continue
        return
        end
c-------------------------------------------------------------------
c
c                     Subroutine GE5
c
c-------------------------------------------------------------------
        subroutine ge5

        integer ba,bas,i,x,z,a,b,tracel
        integer des(99,7),org(99,8),all(2,99,8)
        common/blockl/ba,bas,base
     *        /block2/des,org
     *        /block3/all
     *        /block4/z,tracel
c-------------------------------------------------------------------
        if(tracel.eq.1) then
            print'(//,16x,"Traces for GE5",/)'
        endif
        do 700 i=1,ba
            if(des(i,5).eq.0) then
                go to 700
```

```
            endif
            do 710 x=1,bas
            if((org(x,6).eq.0).and.(org(x,7).eq.0)) then
                go to 710
            endif
                if((des(i,5).ge.org(x,6)).and.(des(i,6).lt.org(x,7)))
     *            then
                    z = z + 1
                    if(z.le.99) then
                        a = 1
                        b = z
                    else
                        a = 2
                        b = z - 99
                    endif
                    all(a,b,1) = org(x,1)
                    all(a,b,2) = des(i,1)
                    all(a,b,3) = org(x,2)
                    all(a,b,7) = org(x,6)
                    all(a,b,8) = des(i,6)
                    des(i,5) = des(i,5) - org(x,6)
                    org(x,6) = 0
                    org(x,7) = org(x,7) - des(i,6)
                    des(i,6) = 0
                    if(tracel.eq.1) then
                        print'(5x,"Match no.",i3)',z
                        print'(5x,"Theater base - ",i2)',des(i,1)
                        print'(5x,"CONUS base - ",i2,/)',org(x,2)
                    endif
                    go to 700
                endif
710         continue
700     continue
        return
        end
```

APPENDIX C

PROGRAM RESULTS WITH TRACES

TRACE RUN

ORIGINAL REQUIREMENTS AND RESOURCES

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	2	1	2	1
2	2	1	2	1	0
3	1	3	1	1	1
4	0	1	1	3	2
5	1	1	1	1	1
6	2	3	1	4	1
7	3	2	1	5	1
8	1	2	1	3	1
9	4	5	2	1	0
TOTAL	15	20	11	21	8

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	1	1	1	1	1
2	2	2	2	0	3	3
3	3	2	3	0	3	1
4	4	2	1	0	3	1
5	5	2	2	0	3	1
6	6	3	2	1	4	1
7	7	2	3	0	3	1
1	8	1	1	1	3	1
2	9	1	3	1	1	1
3	10	1	2	2	4	1
4	11	2	3	0	4	1
TOTAL		19	23	6	32	13

Traces for EQ1T06

Match no. 1
Theater base = 3

CONUS base - 9

Match no. 2
Theater base - 5
CONUS base - 1

Equality Among Teams

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	2	1	2	1
2	2	1	2	1	0
3	0	0	0	0	0
4	0	1	1	3	2
5	0	0	0	0	0
6	2	3	1	4	1
7	3	2	1	5	1
8	1	2	1	3	1
9	4	5	2	1	0
TOTAL	13	16	9	19	6

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	0	0	0	0	0
2	2	2	2	0	3	3
3	3	2	3	0	3	1
4	4	2	1	0	3	1
5	5	2	2	0	3	1
6	6	3	2	1	4	1
7	7	2	3	0	3	1
1	8	1	1	1	3	1
2	9	0	0	0	0	0
3	10	1	2	2	4	1
4	11	2	3	0	4	1
TOTAL		17	19	4	30	11

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			2	4	2	2	2

Traces for EQ123

Match no. 3
Theater base - 7
CONUS base - 6

Equality Among PB teams 1,2,3

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	2	1	2	1
2	2	1	2	1	0
3	0	0	0	0	0
4	0	1	1	3	2
5	0	0	0	0	0
6	2	3	1	4	1
7	0	0	0	5	1
8	1	2	1	3	1
9	4	5	2	1	0
TOTAL	10	14	8	19	6

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	0	0	0	0	0
2	2	2	2	0	3	3
3	3	2	3	0	3	1
4	4	2	1	0	3	1
5	5	2	2	0	3	1
6	6	0	0	0	4	1
7	7	2	3	0	3	1
1	8	1	1	1	3	1
2	9	0	0	0	0	0
3	10	1	2	2	4	1
4	11	2	3	0	4	1
TOTAL		14	17	3	30	11

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			5	6	3	2	2

Traces for GE123

Match no. 4
Theater base - 9
CONUS base - 3

Match no. 5
Theater base - 6
CONUS base - 7

Match no. 6
Theater base - 2
CONUS base - 4

Match no. 7
Theater base - 1
CONUS base - 8

Greater Than or Equal to PB 1,2,3 Teams

Theater Requirements

Theater	Prime BEEF Teams				
Base	CF-1	CF-2	CF-3	CF-5	CF-6
9	2	2	2	1	0
6	0	0	1	4	1
2	0	0	2	1	0
1	0	1	0	2	1
8	1	2	1	3	1
4	0	1	1	3	2
3	0	0	0	0	0
5	0	0	0	0	0
7	0	0	0	5	1
TOTAL	3	6	7	19	6

CONUS Resources

	CONUS	Prime BEEF Teams				
Command	Base	CF-1	CF-2	CF-3	CF-5	CF-6
3	3	0	0	0	3	1
7	7	0	0	0	3	1
3	10	1	2	2	4	1
4	11	2	3	0	4	1
2	2	2	2	0	3	3
5	5	2	2	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
1	1	0	0	0	0	0
6	6	0	0	0	4	1
2	9	0	0	0	0	0
TOTAL		7	9	2	30	11

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
			Prime BEEF Teams				
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			12	14	4	2	2

Traces for GE12

Match no. 8
Theater base - 9
CONUS base - 10

Greater Than or Equal to PB 1,2 Teams

Theater Requirements

Theater Base	CF-1	CF-2	CF-3	CF-5	CF-6
	Prime BEEF Teams				
9	1	0	0	1	0
8	1	2	1	3	1
2	0	0	2	1	0
4	0	1	1	3	2
6	0	0	1	4	1
1	0	1	0	2	1
3	0	0	0	0	0
5	0	0	0	0	0
7	0	0	0	5	1
TOTAL	2	4	5	19	6

CONUS Resources

Command	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
		Prime BEEF Teams				
3	10	0	0	0	4	1
4	11	2	3	0	4	1
2	2	2	2	0	3	3
5	5	2	2	0	3	1
3	3	0	0	0	3	1
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
1	1	0	0	0	0	0
6	6	0	0	0	4	1
2	9	0	0	0	0	0
TOTAL		6	7	0	30	11

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
			Prime BEEF Teams				
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			13	16	6	2	2

Traces for All PB 1,2,3 Teams

Match no. 9
Theater base - 8
CONUS base - 11

Match no. 10
Theater base - 4
CONUS base - 11

Match no. 11
Theater base - 9
CONUS base - 11

Match no. 12
Theater base - 1
CONUS base - 2

All PB 1,2,3 Teams

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
8	0	0	1	3	1
2	0	0	2	1	0
4	0	0	1	3	2
9	0	0	0	1	0
6	0	0	1	4	1
1	0	0	0	2	1
3	0	0	0	0	0
5	0	0	0	0	0
7	0	0	0	5	1
TOTAL	0	0	5	19	6

CONUS Resources

Command	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
		Prime BEEF Teams				
4	11	0	0	0	4	1
2	2	2	1	0	3	3
5	5	2	2	0	3	1
3	10	0	0	0	4	1
3	3	0	0	0	3	1
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
1	1	0	0	0	0	0
6	6	0	0	0	4	1
2	9	0	0	0	0	0
TOTAL		4	3	0	30	11

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
			Prime BEEF Teams				
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			15	20	6	2	2

Traces for EQ56

Match no. 13
Theater base - 8
CONUS base - 5

Match no. 14
Theater base - 6
CONUS base - 11

Equal PB 5,6 Teams

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	0	0	2	1	0
8	0	0	1	0	0
4	0	0	1	3	2
6	0	0	1	0	0
9	0	0	0	1	0
1	0	0	0	2	1
3	0	0	0	0	0
5	0	0	0	0	0
7	0	0	0	5	1
TOTAL	0	0	5	12	4

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
5	5	2	2	0	0	0
2	2	2	1	0	3	3
4	11	0	0	0	0	0
3	10	0	0	0	4	1
3	3	0	0	0	3	1
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
1	1	0	0	0	0	0
6	6	0	0	0	4	1
2	9	0	0	0	0	0
TOTAL		4	3	0	23	9

Prime BEEF Team Tasking

	Theater	CONUS		Prime BEEF Teams			
Command	Base	Base	CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
5	8	5	0	0	0	3	1
4	6	11	0	0	0	4	1
0	0	0	0	0	0	0	0
TOTAL			15	20	6	9	4

Traces for GE56

Match no. 15
Theater base - 7
CONUS base - 10

Match no. 16
Theater base - 4
CONUS base - 3

Greater Than or Equal PB 5,6 Teams

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
7	0	0	0	1	0
4	0	0	1	0	1
1	0	0	0	2	1
2	0	0	2	1	0
9	0	0	0	1	0
8	0	0	1	0	0
6	0	0	1	0	0
3	0	0	0	0	0
5	0	0	0	0	0
TOTAL	0	0	5	5	2

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	2	2	1	0	3	3
3	10	0	0	0	0	0
6	6	0	0	0	4	1
3	3	0	0	0	0	0
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
5	5	2	2	0	0	0
4	11	0	0	0	0	0
1	1	0	0	0	0	0
2	9	0	0	0	0	0
TOTAL		4	3	0	16	7

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
			Prime BEEF Teams				
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
5	8	5	0	0	0	3	1
4	6	11	0	0	0	4	1
3	7	10	0	0	0	4	1
3	4	3	0	0	0	3	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			15	20	6	16	6

Traces for GE5

Greater Than or Equal PB 5 Team

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	0	0	0	2	1
7	0	0	0	1	0
4	0	0	1	0	1
2	0	0	2	1	0
9	0	0	0	1	0
8	0	0	1	0	0
6	0	0	1	0	0
3	0	0	0	0	0
5	0	0	0	0	0
TOTAL	0	0	5	5	2

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	2	2	1	0	3	3
6	6	0	0	0	4	1
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
3	10	0	0	0	0	0
3	3	0	0	0	0	0
5	5	2	2	0	0	0
4	11	0	0	0	0	0
1	1	0	0	0	0	0
2	9	0	0	0	0	0
TOTAL		4	3	0	16	7

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
5	8	5	0	0	0	3	1
4	6	11	0	0	0	4	1
3	7	10	0	0	0	4	1
3	4	3	0	0	0	3	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			15	20	6	16	6

All PB 5,6 Teams

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	0	0	0	0	0
7	0	0	0	0	0
4	0	0	1	0	0
2	0	0	2	0	0
9	0	0	0	0	0
8	0	0	1	0	0
6	0	0	1	0	0
3	0	0	0	0	0
5	0	0	0	0	0
TOTAL	0	0	5	0	0

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	2	2	1	0	0	1
6	6	0	0	0	2	1
7	7	0	0	0	3	1
4	4	0	0	0	3	1
1	8	0	0	0	3	1
3	10	0	0	0	0	0
3	3	0	0	0	0	0
5	5	2	2	0	0	0
4	11	0	0	0	0	0
1	1	0	0	0	0	0
2	9	0	0	0	0	0
TOTAL		4	3	0	11	5

Prime BEEF Team Tasking

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
5	8	5	0	0	0	3	1
4	6	11	0	0	0	4	1
3	7	10	0	0	0	4	1
3	4	3	0	0	0	3	1
2	1	2	0	0	0	2	1
2	7	2	0	0	0	1	0
2	4	2	0	0	0	0	1
6	2	6	0	0	0	1	0
6	9	6	0	0	0	1	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			15	20	6	21	8

FINAL PRIME BEEF TEAM TASKING

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
2	3	9	1	3	1	1	1
1	5	1	1	1	1	1	1
6	7	6	3	2	1	0	0
3	9	3	2	3	0	0	0
7	6	7	2	3	0	0	0
4	2	4	2	1	0	0	0
1	1	8	1	1	1	0	0
3	9	10	1	2	2	0	0
4	8	11	1	2	0	0	0
4	4	11	0	1	0	0	0
4	9	11	1	0	0	0	0
2	1	2	0	1	0	0	0
5	8	5	0	0	0	3	1
4	6	11	0	0	0	4	1
3	7	10	0	0	0	4	1
3	4	3	0	0	0	3	1
2	1	2	0	0	0	2	1
2	7	2	0	0	0	1	0
2	4	2	0	0	0	0	1
6	2	6	0	0	0	1	0
6	9	6	0	0	0	1	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			15	20	6	21	8

PRIME BEEF TEAM TASKING BY THEATER BASE

Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	2	0	0	0	2	1
1	8	1	1	1	0	0
1	2	0	1	0	0	0
2	6	0	0	0	1	0
2	4	2	1	0	0	0
3	9	1	3	1	1	1
4	3	0	0	0	3	1
4	2	0	0	0	0	1
4	11	0	1	0	0	0
5	1	1	1	1	1	1
6	7	2	3	0	0	0
6	11	0	0	0	4	1
7	6	3	2	1	0	0
7	2	0	0	0	1	0
7	10	0	0	0	4	1
8	11	1	2	0	0	0
8	5	0	0	0	3	1
9	3	2	3	0	0	0
9	6	0	0	0	1	0
9	10	1	2	2	0	0
9	11	1	0	0	0	0
TOTAL		15	20	6	21	8

PRIME BEEF TEAM TASKING BY CONUS BASE

Command	CONUS Base	Theater Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
1	1	5	1	1	1	1	1
2	2	1	0	0	0	2	1
2	2	7	0	0	0	1	0
2	2	4	0	0	0	0	1
2	2	1	0	1	0	0	0
3	3	4	0	0	0	3	1
3	3	9	2	3	0	0	0
4	4	2	2	1	0	0	0
5	5	8	0	0	0	3	1
6	6	7	3	2	1	0	0
6	6	2	0	0	0	1	0
6	6	9	0	0	0	1	0
7	7	6	2	3	0	0	0
1	8	1	1	1	1	0	0
2	9	3	1	3	1	1	1
3	10	9	1	2	2	0	0
3	10	7	0	0	0	4	1
4	11	8	1	2	0	0	0
4	11	4	0	1	0	0	0
4	11	9	1	0	0	0	0
4	11	6	0	0	0	4	1
TOTAL			15	20	6	21	8

PRIME BEEF TEAM TASKING: MAJCOM - 1

Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
5	1	1	1	1	1	1
1	8	1	1	1	0	0

PRIME BEEF TEAM TASKING: MAJCOM - 2

Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
3	9	1	3	1	1	1
1	2	0	0	0	2	1
7	2	0	0	0	1	0
4	2	0	0	0	0	1
1	2	0	1	0	0	0

PRIME BEEF TEAM TASKING: MAJCOM - 3

Theater Base	CONUS Base	CF-1	CF-2	CF-3	CF-5	CF-6
4	3	0	0	0	3	1
9	3	2	3	0	0	0
9	10	1	2	2	0	0
7	10	0	0	0	4	1

PRIME BEEF TEAM TASKING: MAJCOM - 4

Theater Base	CONUS Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6
2	4	2	1	0	0	0
8	11	1	2	0	0	0
4	11	0	1	0	0	0
9	11	1	0	0	0	0
6	11	0	0	0	4	1

PRIME BEEF TEAM TASKING: MAJCOM - 5

Theater Base	CONUS Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6
8	5	0	0	0	3	1

PRIME BEEF TEAM TASKING: MAJCOM - 6

Theater Base	CONUS Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6
7	6	3	2	1	0	0
2	6	0	0	0	1	0
9	6	0	0	0	1	0

PRIME BEEF TEAM TASKING: MAJCOM - 7

Theater Base	CONUS Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6
6	7	2	3	0	0	0

APPENDIX D

INPUT DATA STRUCTURES

TRACE INPUT DATA STRUCTURES

1	1	1	1	1	1	1
2	2	2	2	0	3	3
3	3	2	3	0	3	1
4	4	2	1	0	3	1
5	5	2	2	0	3	1
6	6	3	2	1	4	1
7	7	2	3	0	3	1
1	8	1	1	1	3	1
2	9	1	3	1	1	1
3	10	1	2	2	4	1
4	11	2	3	0	4	1

1	1	2	1	2	1
2	2	1	2	1	0
3	1	3	1	1	1
4	0	1	1	3	2
5	1	1	1	1	1
6	2	3	1	4	1
7	3	2	1	5	1
8	1	2	1	3	1
9	4	5	2	1	0

REQUIREMENT INPUT DATA STRUCTURES

1	1	1	0	0	0
2	1	0	0	0	0
3	1	0	0	0	0
4	2	0	1	0	1
5	1	2	0	0	0
6	1	0	0	0	0
7	1	2	0	0	0
8	1	0	0	0	0
9	1	0	0	0	0
10	2	1	0	1	0
11	1	2	0	0	0
12	1	0	0	0	1
13	1	0	0	0	0
14	2	0	0	0	1
15	1	0	0	0	0
16	1	1	0	0	0
17	1	0	0	0	0
18	1	1	0	1	0
19	2	2	0	6	1
20	2	0	1	0	1
21	1	0	0	0	0
22	2	0	1	0	0
23	1	1	0	0	0
24	1	0	0	0	0
25	1	0	0	0	0
26	1	1	0	0	0
27	1	0	0	0	1
28	1	0	0	0	0
29	2	0	0	3	0
30	1	0	0	0	0
31	1	0	0	0	0
32	2	0	0	0	0
33	1	0	0	0	0
34	1	0	0	0	0
35	1	0	0	0	0
36	1	0	0	0	0
37	2	0	0	0	0
38	1	0	0	0	0
39	1	0	0	3	0
40	2	0	1	0	0
41	1	0	0	0	0
42	0	2	0	0	0
43	0	1	0	2	0
44	0	1	0	0	0
45	0	2	0	0	0
46	0	0	0	0	0
47	0	0	0	0	0
48	0	2	1	0	1
49	0	1	0	1	0
50	0	1	0	0	0
51	0	3	0	0	0
52	0	2	0	0	0
53	0	1	0	0	0
54	0	1	0	3	0
55	0	1	0	0	0
56	0	0	1	0	0
57	0	0	1	0	1
58	0	0	1	0	0
59	0	0	1	0	0
60	0	0	1	0	0
61	0	0	1	0	0
62	0	0	1	2	1
63	0	0	1	0	0
64	0	0	1	2	0
65	0	0	1	0	1
66	0	0	1	0	0
67	0	0	0	1	0
68	0	0	0	1	0
69	0	0	0	1	0
70	0	0	0	1	1
71	0	0	0	3	0
72	0	0	0	1	0
73	0	0	0	0	1
74	0	0	0	0	1
75	0	0	0	0	1
76	0	0	0	0	1
77	0	0	0	0	1
78	0	0	0	0	1

RESOURCES INPUT DATA STRUCTURES

7	1	1	1	1	0	0
3	2	1	2	1	1	1
3	3	1	1	1	3	0
3	4	1	0	1	2	0
3	5	1	2	2	3	1
3	6	0	0	0	2	1
3	7	1	1	1	3	0
3	8	2	1	1	1	0
3	9	1	2	0	3	1
3	10	1	1	1	4	1
3	11	0	0	0	3	0
3	12	1	1	0	3	1
3	13	1	1	0	0	0
3	14	2	2	1	3	1
3	15	0	1	0	3	1
1	16	3	3	1	0	0
1	17	2	2	1	0	0
1	18	1	3	1	0	0
1	19	2	3	1	0	0
1	20	1	3	0	0	0
4	21	1	1	1	2	0
4	22	3	3	1	0	1
4	23	1	1	1	0	0
4	24	1	2	0	1	0
4	25	1	2	0	1	0
4	26	1	1	1	3	1
4	27	2	2	1	0	1
4	28	2	1	1	0	1
4	29	2	2	0	1	0
4	30	2	1	1	1	0
4	31	2	1	0	2	0
4	32	1	2	1	1	2
4	33	2	3	0	1	0
2	34	0	0	0	1	0
2	35	3	2	1	6	1
2	36	3	3	2	14	1
2	37	1	1	1	1	1
2	38	2	1	1	3	1
6	39	1	1	1	4	1
6	40	2	2	0	3	1
6	41	2	3	0	3	1
6	42	2	1	0	3	1
6	43	2	2	0	3	1
6	44	3	2	1	4	1
6	45	3	2	1	4	1
6	46	1	1	1	3	1
6	47	1	3	0	4	1
6	48	1	3	0	4	1
6	49	2	3	0	4	1
6	50	0	1	0	2	1
6	51	2	2	0	3	1
6	52	1	1	1	3	1
6	53	4	4	0	6	1
6	54	2	2	1	3	1
6	55	3	2	1	4	1
6	56	2	2	0	2	1
5	57	1	0	1	1	0
5	58	2	0	1	1	0
5	59	1	1	0	1	1
5	60	1	1	0	1	1
5	61	1	1	0	1	1
5	62	1	1	1	1	0
5	63	2	0	0	2	0
5	64	2	0	0	0	0
5	65	2	0	0	1	1
5	66	2	2	0	1	1
5	67	1	1	0	1	0
5	68	1	0	0	0	0
5	69	2	0	0	1	0
5	70	1	0	1	0	0
5	71	2	2	0	1	1
5	72	1	2	0	1	1
5	73	2	2	0	1	0
5	74	2	2	1	1	0
5	75	1	0	0	1	1
5	76	1	1	0	1	0
5	77	1	1	0	0	0
5	78	1	0	0	1	0
5	79	2	0	1	0	0
5	80	1	0	0	1	1
5	81	1	1	0	1	0

APPENDIX E

SAMPLE PROGRAM OUTPUT

ORIGINAL REQUIREMENTS AND RESOURCES

Theater Requirements

Theater Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
1	1	1	0	0	0
2	1	0	0	0	0
3	1	0	0	0	0
4	2	0	1	0	1
5	1	2	0	0	0
6	1	0	0	0	0
7	1	2	0	0	0
8	1	0	0	0	0
9	1	0	0	0	0
10	2	1	0	1	0
11	1	2	0	0	0
12	1	0	0	0	1
13	1	0	0	0	0
14	2	0	0	0	1
15	1	0	0	0	0
16	1	1	0	0	0
17	1	0	0	0	0
18	1	1	0	1	0
19	2	2	0	6	1
20	2	0	1	0	1
21	1	0	0	0	0
22	2	0	1	0	0
23	1	1	0	0	0
24	1	0	0	0	0
25	1	0	0	0	0
26	1	1	0	0	0
27	1	0	0	0	1
28	1	0	0	0	0
29	2	0	0	3	0
30	1	0	0	0	0
31	1	0	0	0	0
32	2	0	0	0	0
33	1	0	0	0	0
34	1	0	0	0	0
35	1	0	0	0	0
36	1	0	0	0	0
37	2	0	0	0	0
38	1	0	0	0	0
39	1	0	0	3	0
40	2	0	1	0	0
41	1	0	0	0	0
42	0	2	0	0	0

43	0	1	0	2	0
44	0	1	0	0	0
45	0	2	0	0	0
46	0	0	0	0	0
47	0	0	0	0	0
48	0	2	1	0	1
49	0	1	0	1	0
50	0	1	0	0	0
51	0	3	0	0	0
52	0	2	0	0	0
53	0	1	0	0	0
54	0	1	0	3	0
55	0	1	0	0	0
56	0	0	1	0	0
57	0	0	1	0	1
58	0	0	1	0	0
59	0	0	1	0	0
60	0	0	1	0	0
61	0	0	1	0	0
62	0	0	1	2	1
63	0	0	1	0	0
64	0	0	1	2	0
65	0	0	1	0	1
66	0	0	1	0	0
67	0	0	0	1	0
68	0	0	0	1	0
69	0	0	0	1	0
70	0	0	0	1	1
71	0	0	0	3	0
72	0	0	0	1	0
73	0	0	0	0	1
74	0	0	0	0	1
75	0	0	0	0	1
76	0	0	0	0	1
77	0	0	0	0	1
78	0	0	0	0	1
TOTAL	51	32	16	32	17

CONUS Resources

Command	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
7	1	1	1	1	0	0
3	2	1	2	1	1	1
3	3	1	1	1	3	0
3	4	1	0	1	2	0
3	5	1	2	2	3	1
3	6	0	0	0	2	1
3	7	1	1	1	3	0
3	8	2	1	1	1	0
3	9	1	2	0	3	1
3	10	1	1	1	4	1
3	11	0	0	0	3	0
3	12	1	1	0	3	1
3	13	1	1	0	0	0
3	14	2	2	1	3	1
3	15	0	1	0	3	1
1	16	3	3	1	0	0
1	17	2	2	1	0	0
1	18	1	3	1	0	0
1	19	2	3	1	0	0
1	20	1	3	0	0	0
4	21	1	1	1	2	0
4	22	3	3	1	0	1
4	23	1	1	1	0	0
4	24	1	2	0	1	0
4	25	1	2	0	1	0
4	26	1	1	1	3	1
4	27	2	2	1	0	1
4	28	2	1	1	0	1
4	29	2	2	0	1	0
4	30	2	1	1	1	0
4	31	2	1	0	2	0
4	32	1	2	1	1	2
4	33	2	3	0	1	0
2	34	0	0	0	1	0
2	35	3	2	1	6	1
2	36	3	3	2	14	1
2	37	1	1	1	1	1
2	38	2	1	1	3	1
6	39	1	1	1	4	1
6	40	2	2	0	3	1
6	41	2	3	0	3	1
6	42	2	1	0	3	1
6	43	2	2	0	3	1
6	44	3	2	1	4	1

6	45	3	2	1	4	1
6	46	1	1	1	3	1
6	47	1	3	0	4	1
6	48	1	3	0	4	1
6	49	2	3	0	4	1
6	50	0	1	0	2	1
6	51	2	2	0	3	1
6	52	1	1	1	3	1
6	53	4	4	0	6	1
6	54	2	2	1	3	1
6	55	3	2	1	4	1
6	56	2	2	0	2	1
5	57	1	0	1	1	0
5	58	2	0	1	1	0
5	59	1	1	0	1	1
5	60	1	1	0	1	1
5	61	1	1	0	1	1
5	62	1	1	1	1	0
5	63	2	0	0	2	0
5	64	2	0	0	0	0
5	65	2	0	0	1	1
5	66	2	2	0	1	1
5	67	1	1	0	1	0
5	68	1	0	0	0	0
5	69	2	0	0	1	0
5	70	1	0	1	0	0
5	71	2	2	0	1	1
5	72	1	2	0	1	1
5	73	2	2	0	1	0
5	74	2	2	1	1	0
5	75	1	0	0	1	1
5	76	1	1	0	1	0
5	77	1	1	0	0	0
5	78	1	0	0	1	0
5	79	2	0	1	0	0
5	80	1	0	0	1	1
5	81	1	1	0	1	0
TOTAL		122	114	40	155	45

FINAL PRIME BEEF TEAM TASKING

Command	Theater Base	CONUS Base	Prime BEEF Teams CF-1	CF-2	CF-3	CF-5	CF-6
4	19	29	2	2	0	0	0
5	4	58	2	0	1	0	0
3	5	9	1	2	0	0	0
4	7	24	1	2	0	0	0
4	10	31	2	1	0	0	0
4	11	25	1	2	0	0	0
5	20	79	2	0	1	0	0
3	22	4	1	0	1	0	0
5	40	57	1	0	1	0	0
3	48	15	0	1	0	0	0
6	51	50	0	1	0	0	0
3	1	12	1	1	0	0	0
5	14	63	2	0	0	0	0
3	16	13	1	1	0	0	0
5	18	59	1	1	0	0	0
5	23	60	1	1	0	0	0
5	26	61	1	1	0	0	0
5	29	64	2	0	0	0	0
5	32	65	2	0	0	0	0
5	37	69	2	0	0	0	0
5	2	68	1	0	0	0	0
5	3	75	1	0	0	0	0
5	6	78	1	0	0	0	0
5	8	80	1	0	0	0	0
2	48	36	0	1	1	0	0
2	51	36	0	2	0	0	0
6	42	53	0	2	0	0	0
6	45	53	0	2	0	0	0
1	52	16	0	2	0	0	0
2	22	36	1	0	0	0	0
2	40	36	1	0	0	0	0
2	9	36	1	0	0	0	0
6	12	53	1	0	0	0	0
6	13	53	1	0	0	0	0
6	15	53	1	0	0	0	0
6	17	53	1	0	0	0	0
1	21	16	1	0	0	0	0
1	24	16	1	0	0	0	0
1	25	16	1	0	0	0	0
4	27	22	1	0	0	0	0
4	28	22	1	0	0	0	0
4	30	22	1	0	0	0	0
1	31	19	1	0	0	0	0

1	33	19	1	0	0	0	0
2	34	35	1	0	0	0	0
2	35	35	1	0	0	0	0
2	36	35	1	0	0	0	0
6	38	44	1	0	0	0	0
6	39	44	1	0	0	0	0
6	41	44	1	0	0	0	0
1	43	16	0	1	0	0	0
4	44	22	0	1	0	0	0
4	49	22	0	1	0	0	0
4	50	22	0	1	0	0	0
1	53	19	0	1	0	0	0
1	54	19	0	1	0	0	0
1	55	19	0	1	0	0	0
2	56	36	0	0	1	0	0
1	57	16	0	0	1	0	0
4	58	22	0	0	1	0	0
1	59	19	0	0	1	0	0
2	60	35	0	0	1	0	0
6	61	44	0	0	1	0	0
6	62	45	0	0	1	0	0
6	63	55	0	0	1	0	0
3	64	5	0	0	1	0	0
3	65	5	0	0	1	0	0
3	66	14	0	0	1	0	0
6	62	56	0	0	0	2	1
2	19	35	0	0	0	6	1
3	70	2	0	0	0	1	1
3	39	3	0	0	0	3	0
3	54	7	0	0	0	3	0
3	29	11	0	0	0	3	0
4	71	21	0	0	0	2	0
4	43	31	0	0	0	2	0
3	64	4	0	0	0	2	0
4	49	33	0	0	0	1	0
5	10	74	0	0	0	1	0
3	18	8	0	0	0	1	0
4	67	30	0	0	0	1	0
5	68	73	0	0	0	1	0
5	69	62	0	0	0	1	0
5	72	67	0	0	0	1	0
4	71	32	0	0	0	1	0
2	48	36	0	0	0	0	1
6	12	53	0	0	0	0	1
6	27	45	0	0	0	0	1
6	57	55	0	0	0	0	1
6	65	49	0	0	0	0	1
6	4	47	0	0	0	0	1
6	20	48	0	0	0	0	1
3	14	10	0	0	0	0	1
6	73	39	0	0	0	0	1
6	74	44	0	0	0	0	1

6	75	41	0	0	0	0	1
6	76	54	0	0	0	0	1
3	77	14	0	0	0	0	1
2	78	38	0	0	0	0	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
TOTAL			51	32	16	32	17

PRIME BEEF TEAM TASKING BY THEATER BASE

Theater Base	CONUS Base	CF-1	Prime BEEF Teams CF-2	CF-3	CF-5	CF-6
1	12	1	1	0	0	0
2	68	1	0	0	0	0
3	75	1	0	0	0	0
4	58	2	0	1	0	0
4	47	0	0	0	0	1
5	9	1	2	0	0	0
6	78	1	0	0	0	0
7	24	1	2	0	0	0
8	80	1	0	0	0	0
9	36	1	0	0	0	0
10	31	2	1	0	0	0
10	74	0	0	0	1	0
11	25	1	2	0	0	0
12	53	1	0	0	0	0
12	53	0	0	0	0	1

13	53	1	0	0	0	0
14	63	2	0	0	0	0
14	10	0	0	0	0	1
15	53	1	0	0	0	0
16	13	1	1	0	0	0
17	53	1	0	0	0	0
18	59	1	1	0	0	0
18	8	0	0	0	1	0
19	29	2	2	0	0	0
19	35	0	0	0	6	1
20	79	2	0	1	0	0
20	48	0	0	0	0	1
21	16	1	0	0	0	0
22	4	1	0	1	0	0
22	36	1	0	0	0	0
23	60	1	1	0	0	0
24	16	1	0	0	0	0
25	16	1	0	0	0	0
26	61	1	1	0	0	0
27	22	1	0	0	0	0
27	45	0	0	0	0	1
28	22	1	0	0	0	0
29	64	2	0	0	0	0
29	11	0	0	0	3	0
30	22	1	0	0	0	0
31	19	1	0	0	0	0
32	65	2	0	0	0	0
33	19	1	0	0	0	0
34	35	1	0	0	0	0
35	35	1	0	0	0	0

36	35	1	0	0	0	0
37	69	2	0	0	0	0
38	44	1	0	0	0	0
39	44	1	0	0	0	0
39	3	0	0	0	3	0
40	57	1	0	1	0	0
40	36	1	0	0	0	0
41	44	1	0	0	0	0
42	53	0	2	0	0	0
43	16	0	1	0	0	0
43	31	0	0	0	2	0
44	22	0	1	0	0	0
45	53	0	2	0	0	0
48	15	0	1	0	0	0
48	36	0	1	1	0	0
48	36	0	0	0	0	1
49	22	0	1	0	0	0
49	33	0	0	0	1	0
50	22	0	1	0	0	0
51	50	0	1	0	0	0
51	36	0	2	0	0	0
52	16	0	2	0	0	0
53	19	0	1	0	0	0
54	19	0	1	0	0	0
54	7	0	0	0	3	0
55	19	0	1	0	0	0
56	36	0	0	1	0	0
57	16	0	0	1	0	0
57	55	0	0	0	0	1
58	22	0	0	1	0	0

59	19	0	0	1	0	0
60	35	0	0	1	0	0
61	44	0	0	1	0	0
62	45	0	0	1	0	0
62	56	0	0	0	2	1
63	55	0	0	1	0	0
64	5	0	0	1	0	0
64	4	0	0	0	2	0
65	5	0	0	1	0	0
65	49	0	0	0	0	1
66	14	0	0	1	0	0
67	30	0	0	0	1	0
68	73	0	0	0	1	0
69	62	0	0	0	1	0
70	2	0	0	0	1	1
71	21	0	0	0	2	0
71	32	0	0	0	1	0
72	67	0	0	0	1	0
73	39	0	0	0	0	1
74	44	0	0	0	0	1
75	41	0	0	0	0	1
76	54	0	0	0	0	1
77	14	0	0	0	0	1
78	38	0	0	0	0	1
TOTAL		51	32	16	32	17

PRIME BEEF TEAM TASKING BY CONUS BASE

Command	CONUS Base	Theater Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6
3	2	70	0	0	0	1	1
3	3	39	0	0	0	3	0
3	4	22	1	0	1	0	0
3	4	64	0	0	0	2	0
3	5	64	0	0	1	0	0
3	5	65	0	0	1	0	0
3	7	54	0	0	0	3	0
3	8	18	0	0	0	1	0
3	9	5	1	2	0	0	0
3	10	14	0	0	0	0	1
3	11	29	0	0	0	3	0
3	12	1	1	1	0	0	0
3	13	16	1	1	0	0	0
3	14	66	0	0	1	0	0
3	14	77	0	0	0	0	1
3	15	48	0	1	0	0	0
1	16	52	0	2	0	0	0
1	16	21	1	0	0	0	0
1	16	24	1	0	0	0	0
1	16	25	1	0	0	0	0
1	16	43	0	1	0	0	0
1	16	57	0	0	1	0	0
1	19	31	1	0	0	0	0
1	19	33	1	0	0	0	0
1	19	53	0	1	0	0	0
1	19	54	0	1	0	0	0
1	19	55	0	1	0	0	0
1	19	59	0	0	1	0	0
4	21	71	0	0	0	2	0
4	22	27	1	0	0	0	0
4	22	28	1	0	0	0	0
4	22	30	1	0	0	0	0
4	22	44	0	1	0	0	0
4	22	49	0	1	0	0	0
4	22	50	0	1	0	0	0
4	22	58	0	0	1	0	0
4	24	7	1	2	0	0	0
4	25	11	1	2	0	0	0
4	29	19	2	2	0	0	0
4	30	67	0	0	0	1	0
4	31	10	2	1	0	0	0
4	31	43	0	0	0	2	0

4	32	71	0	0	0	1	0
4	33	49	0	0	0	1	0
2	35	34	1	0	0	0	0
2	35	35	1	0	0	0	0
2	35	36	1	0	0	0	0
2	35	60	0	0	1	0	0
2	35	19	0	0	0	6	1
2	36	48	0	1	1	0	0
2	36	51	0	2	0	0	0
2	36	22	1	0	0	0	0
2	36	40	1	0	0	0	0
2	36	9	1	0	0	0	0
2	36	56	0	0	1	0	0
2	36	48	0	0	0	0	1
2	38	78	0	0	0	0	1
6	39	73	0	0	0	0	1
6	41	75	0	0	0	0	1
6	44	38	1	0	0	0	0
6	44	39	1	0	0	0	0
6	44	41	1	0	0	0	0
6	44	61	0	0	1	0	0
6	44	74	0	0	0	0	1
6	45	62	0	0	1	0	0
6	45	27	0	0	0	0	1
6	47	4	0	0	0	0	1
6	48	20	0	0	0	0	1
6	49	65	0	0	0	0	1
6	50	51	0	1	0	0	0
6	53	42	0	2	0	0	0
6	53	45	0	2	0	0	0
6	53	12	1	0	0	0	0
6	53	13	1	0	0	0	0
6	53	15	1	0	0	0	0
6	53	17	1	0	0	0	0
6	53	12	0	0	0	0	1
6	54	76	0	0	0	0	1
6	55	63	0	0	1	0	0
6	55	57	0	0	0	0	1
6	56	62	0	0	0	2	1
5	57	40	1	0	1	0	0
5	58	4	2	0	1	0	0
5	59	18	1	1	0	0	0
5	60	23	1	1	0	0	0
5	61	26	1	1	0	0	0
5	62	69	0	0	0	1	0
5	63	14	2	0	0	0	0
5	64	29	2	0	0	0	0
5	65	32	2	0	0	0	0
5	67	72	0	0	0	1	0

5	68	2	1	0	0	0	0
5	69	37	2	0	0	0	0
5	73	68	0	0	0	1	0
5	74	10	0	0	0	1	0
5	75	3	1	0	0	0	0
5	78	6	1	0	0	0	0
5	79	20	2	0	1	0	0
5	80	8	1	0	0	0	0
TOTAL			51	32	16	32	17

PRIME BEEF TEAM TASKING: MAJCOM - 1

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
52	16	0	2	0	0	0
21	16	1	0	0	0	0
24	16	1	0	0	0	0
25	16	1	0	0	0	0
31	19	1	0	0	0	0
33	19	1	0	0	0	0
43	16	0	1	0	0	0
53	19	0	1	0	0	0
54	19	0	1	0	0	0
55	19	0	1	0	0	0
57	16	0	0	1	0	0
59	19	0	0	1	0	0

PRIME BEEF TEAM TASKING: MAJCOM - 2

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
48	36	0	1	1	0	0
51	36	0	2	0	0	0
22	36	1	0	0	0	0
40	36	1	0	0	0	0
9	36	1	0	0	0	0
34	35	1	0	0	0	0

35	35	1	0	0	0	0
36	35	1	0	0	0	0
56	36	0	0	1	0	0
60	35	0	0	1	0	0
19	35	0	0	0	6	1
48	36	0	0	0	0	1
78	38	0	0	0	0	1

PRIME BEEF TEAM TASKING: MAJCOM - 3

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
5	9	1	2	0	0	0
22	4	1	0	1	0	0
48	15	0	1	0	0	0
1	12	1	1	0	0	0
16	13	1	1	0	0	0
64	5	0	0	1	0	0
65	5	0	0	1	0	0
66	14	0	0	1	0	0
70	2	0	0	0	1	1
39	3	0	0	0	3	0
54	7	0	0	0	3	0
29	11	0	0	0	3	0
64	4	0	0	0	2	0
18	8	0	0	0	1	0
14	10	0	0	0	0	1
77	14	0	0	0	0	1

PRIME BEEF TEAM TASKING: MAJCOM - 4

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
19	29	2	2	0	0	0
7	24	1	2	0	0	0
10	31	2	1	0	0	0
11	25	1	2	0	0	0
27	22	1	0	0	0	0
28	22	1	0	0	0	0
30	22	1	0	0	0	0
44	22	0	1	0	0	0
49	22	0	1	0	0	0

50	22	0	1	0	0	0
58	22	0	0	1	0	0
71	21	0	0	0	2	0
43	31	0	0	0	2	0
49	33	0	0	0	1	0
67	30	0	0	0	1	0
71	32	0	0	0	1	0

PRIME BEEF TEAM TASKING: MAJCOM - 5

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
4	58	2	0	1	0	0
20	79	2	0	1	0	0
40	57	1	0	1	0	0
14	63	2	0	0	0	0
18	59	1	1	0	0	0
23	60	1	1	0	0	0
26	61	1	1	0	0	0
29	64	2	0	0	0	0
32	65	2	0	0	0	0
37	69	2	0	0	0	0
2	68	1	0	0	0	0
3	75	1	0	0	0	0
6	78	1	0	0	0	0
8	80	1	0	0	0	0
10	74	0	0	0	1	0
68	73	0	0	0	1	0
69	62	0	0	0	1	0
72	67	0	0	0	1	0

PRIME BEEF TEAM TASKING: MAJCOM - 6

Theater Base	CONUS Base	Prime BEEF Team CF-1	CF-2	CF-3	CF-5	CF-6
51	50	0	1	0	0	0
42	53	0	2	0	0	0
45	53	0	2	0	0	0
12	53	1	0	0	0	0
13	53	1	0	0	0	0
15	53	1	0	0	0	0
17	53	1	0	0	0	0

38	44	1	0	0	0	0
39	44	1	0	0	0	0
41	44	1	0	0	0	0
61	44	0	0	1	0	0
62	45	0	0	1	0	0
63	55	0	0	1	0	0
62	56	0	0	0	2	1
12	53	0	0	0	0	1
27	45	0	0	0	0	1
57	55	0	0	0	0	1
65	49	0	0	0	0	1
4	47	0	0	0	0	1
20	48	0	0	0	0	1
73	39	0	0	0	0	1
74	44	0	0	0	0	1
75	41	0	0	0	0	1
76	54	0	0	0	0	1

PRIME BEEF TEAM TASKING: MAJCOM - 7

Theater Base	CONUS Base	CF-1	Prime BEEF Team CF-2	CF-3	CF-5	CF-6

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